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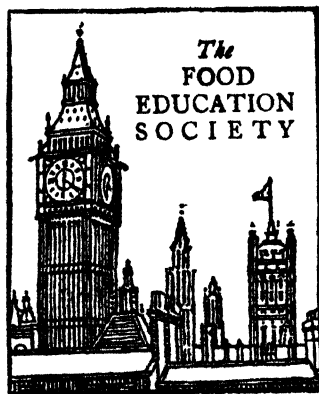
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**THE GATEWAY
TO HEALTH**

THE GATEWAY TO HEALTH

PREVENTION OF DISEASES
OF THE TEETH

EDITED BY
CHARLES E. HECHT, M.A., M.C.A.
("Mr. Scrunch")



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CONTENTS

Introduction	Page 1
Part I. The Call to Action	15
(A) A Grave Indictment	15
Some Hard Facts	15
Yet More Facts	21
Common Preventable Defects of Childhood. By E. H. Wilkins, M.B., Superintendent, School Medical Service, New Zealand	28
A Robber of Industry. By the Medical Correspondent of the <i>Times</i>	37
The Evils of Sweet Eating. By Mrs. L. M. Garrett	42
Travelling Companions	44
(B) The Way Out	47
Prevention of Disease. By a Physician	47
Cure or Prevention?	51
Problem of Dental Disease. By W. E. Nicholls Dunn, M.B. Charles E. Hecht, M.A.	52
Causes and Incidence of Dental Caries. By W. E. Nicholls Dunn, Major, R.A.M.C.; Harry Campbell, M.D.; H. Beckett-Overy, M.D., F.R.C.S.	57
The Three Chief Offenders	60
I. Sugar and Sweets	60
An American Medical Pronouncement. By E. H. Bradford, M.D.; J. J. Sutherland, M.D.; and Charles F. Painter, M.D., Deans of Harvard, Boston University and Tufts College Medical Schools	60
Sugar and Children's Diet. By M.C.A. and Charles E. Hecht, M.A., M.C.A.	61
Sugar in Babies' Bottles	64
Sugar and Dental Caries. By A. C. Fones, D.D.S.	64
Opinions—Ancient and Modern	65
II. Carbohydrates and Carbohydrates	66
Pyorrhœa Alveolaris—a Theory as to its Etiology. By Stanley Colyer, M.D.	68
An Additional Note. By Stanley Colyer, M.D.	77

Some Experiments on Bread. By J. Sim Wallace, D.Sc., M.D., L.D.S.	80
Bread and Flour. By May Yates (Bread and Food Reform League)	92
The Dentist's Ally. By Hamilton Fyfe	96
Porridge	97
Unpolished Rice	99
Does it Matter?	101
III. Milk	102
Cookery and Vitamines. By "The Pudding Lady," Florence Petty, M.C.A.; Leonard Williams, M.D.	106
Nasal Hygiene	108
Antenatal Dietetics. By C. W. Saleeby, M.D., F.Z.S., F.R.S.E.	110
Development of the Teeth: Certain Physiological Considerations. By Eric Pritchard, M.A., M.D.	114
Care of Children's Teeth. By "The Pudding Lady," Florence Petty, M.C.A.	117
Dental Surgery. A Profession for Women	119
What Canada and New Zealand are Doing	121
A Notable Bequest	123
(C) Chiefly About Methods	124
Hygiene in East and West	124
Aids to Fitness	128
Horace Fletcher's Comment	130
Rules for Right Eating. By a Dentist	131
A Questionnaire	132
Real Food Control. By Councillor G. Pickup Holden, Vice-Chairman, Public Health Com- mittee	134
"Fletcherising." By F. Truby King, M.B., C.M.G.	143
At the Children's Welfare Exhibition. By Charles E. Hecht, M.A.	148
Part II. A National Conference	151
(A) First Meeting of General Committee	151
(B) Proceedings of the Manchester Conference	158
Address by Sir William Milligan, M.D.	159
Opening by Sybil, Viscountess Rhondda, D.B.E.	161

INTRODUCTION

ACKNOWLEDGING a copy of *Aids to Fitness* in 1912, Professor Irving Fisher, the distinguished American economist and authority on health, wrote: "I was greatly interested to see this, and think it ought to do much good. The mouth is the gateway to health." These last words supplied a text for brief talks to thousands of school children in this country during the war and suggested the title of the volume.

OUR NATIONAL DIET.—"Diet without doubt," says Dr. Edward Mellanby, "is the key to preventive medicine." In addresses to the Public Health Sectional Committee of the National Council of Women in 1916, and to the Representative Managers of the L.C.C. Elementary Schools, two years later, an attempt was made, as far as is possible in the case of a nation, to frame an indictment against the diet of all classes.

Among the counts were the narrow range of foodstuffs, coupled with the neglect of many nutritious and useful ones, monotonous and unscientific cookery, excessive and improper use of tea. The national dietary was further described as "lacking not only in variety but, what is more serious, in balance." Among the consequences the deplorable amount of preventable illness, inefficient work and shortened life, to say nothing of the loss of intellectual power and achievement, were enumerated.

BRITISH COOKERY.—"All-British cookery," as Dr. Saleeby has termed it, has a heavy responsibility for the unsatisfactory condition in which our public health stands to-day. Thanks in no small measure to the influence and example of Miss Florence Petty ("The Pudding Lady") and her colleagues, the teaching of cookery has, during recent years, been rendered more simple and practical.¹ The training alike of teachers and scholars still, however, falls far short of the ideals held up at the Second Guildhall School Conference, 1913.² There has, moreover, been a bad set-back since the Armistice.³

¹ See also *The Pudding Lady's Recipe Book*, 1s. 6d.

² See *Rearing an Imperial Race*, 8s. 6d.

³ See *Report for Period of the War*, 1s., and for 1919-1920, 6d.

Just as people made haste to return to the whitest of white¹ bread and to as much sugar and sweets as could be had, so the average household reverted, with a sigh of satisfaction, to pre-war methods of cookery and extravagance.²

VEGETABLES.—The increased production of vegetables³ during the war lost not a little of its value through ignorance and negligence. "All that is soluble," to quote Professor Boys, "goes down the drain, and all that is volatile goes up the chimney." Can we wonder that vegetables play such a small part in our diet as compared with France,⁴ where they are deemed worthy to be served as a course by themselves, or that they are disliked by so many children and adults? It would be surprising were it otherwise, especially when as is the case with many of them, their culinary deficiencies are disguised by Voltaire's "one sauce." This makes it difficult to detect such little flavour as survives. Our insular habit of using to excess condiments and sauces, as well as sugar, indiscriminately sprinkled over puddings and sweets of all sorts, is often a mere cloak to disguise bad cookery.

THEORY AND PRACTICE.—Again, notwithstanding the spread of knowledge concerning vitamins and salts, most people give preference to flour and rice deprived of them, take much of their fruit stewed with a large amount of sugar, and fight shy of salads, unfortunately regarded in many quarters as a luxury rather than a necessity. It might be well to dispense with cooking at one meal in the day, not merely to ensure obtaining the vitamins, but to reduce domestic labour. Salad and fruit should play a considerable part in such a repast.⁵

LOW STANDARD OF HEALTH.—Our standard of individual health is, moreover, a deplorably low one. The average "well" man loses, according to Professor Irving Fisher, at least five

¹ See *Eat Victory Bread*, 1d., and *Facts for Patriots*, 2nd and 4th series, 4d. each.

² See *Lessons of the War*, 1d.

³ See *Facts for Patriots*, 2nd series, 4d.

⁴ A member writes: "Having noticed in *Life Without Servants* that the National Food Reform Association (Food Education Society) is teaching the British nation how to cook potatoes and cabbages properly, I enclose a donation (£5), in addition to my annual subscription."—Ed.

⁵ See *Facts for Patriots*, 3rd series, 4d.

days' work a year, owing to so-called minor ailments, colds, etc.; nine-tenths of which might be prevented. The same authority estimates that every day in the United States 1,700 people, or more than the number lost in the *Titanic*, die from preventable causes; that of 3,000,000 sick, one-half are needlessly so, while human life is shortened by at least fifteen years. These statements, it cannot be doubted, are in the main equally applicable on this side of the Atlantic.¹ "When we say we are well," remarked the late Hon. C. S. Rolls, first Treasurer of the Food Education Society, at its inaugural meeting in 1908, a magnificent example of a sound mind in a sound body, "we are really only half well and working at half efficiency." In Samuel Butler's *Erewhon*, the inhabitants of that Utopia were punished for ill-health by imprisonment. We need to change our point of view and to look upon ill-health as a disgrace. The more general adoption of the Chinese system of paying the doctor to be kept well² and visiting him periodically, as we do the dentist, may possibly be the next advance.

ITS REACTION ON THE TEETH.—Our low standard of health naturally extends to the teeth. We are prepared to lose them prematurely, usually through dietetic error or folly, and accordingly come to regard such loss as in the natural order of things. Among my friends is a family who, by faithful adherence to the main principles here enunciated, has achieved a success that is within the reach of all. The husband, to use his wife's phrase, has "beautiful teeth for his age," while she runs him close. The eldest daughter, when having a tooth stopped at the Dental Hospital in Leicester Square, attracted a crowd of students, who per-

¹ 25,663 deaths (32·6 per cent. of the total) were of persons aged 70 years or upwards. In 456 cases the age was 95 or over, and in 85 cases, 100 years or upwards.—Annual Report, Registrar-General for Ireland, 1919.—Ed.

² I am strongly opposed to the suggestion of Dr. Rolleston, M.O.H., Soke, Peterborough, that all persons should be compulsorily examined at 40, said Dr. Alfred Cox, Medical Secretary, British Medical Association, to a *Daily Chronicle* representative. The war taught Englishmen the value of health. Men generally had no longer such a rooted objection to "passing the doctor." They do not now funk the doctor. It would be an excellent thing if all people at the age of forty were examined. This is already largely done in the matter of teeth.—Ed.

formed the operation gratuitously and styled her "the girl with the lovely teeth." The teeth of their son, on entering the Navy, won the unstinted admiration of the Government doctor, who called a colleague across the room to see them. It is not surprising that the lad's athletic record includes 22 medals for swimming and diving, to say nothing of cups. Another daughter met with similar compliments in her candidature for a post in civil life. The chief factors contributing to this result and to health far above the normal, have been breast-feeding, regular practice of mouth hygiene, including rinsing and cleansing, plain living, with crisp and hard food, plenty of fresh fruit and salad, the conservative cookery of vegetables, with a limited allowance of sugar and sweets. The grandchildren are proving themselves "chips of the old block."

Again, only a few weeks ago the writer met a retired City man who, at the age of 70, had almost a complete set of teeth.

A TRUE WORD SPOKEN IN JEST.—There is no reason, in Dr. Harry Campbell's opinion, why people should not have every tooth sound in their heads at 90. The following dialogue from *Punch*, July 9th, 1919, represents the attainable, not the impossible :—

William, aged 90 : " Good-mornin', George, how be 'ee ? "

George, aged 89 : " I bain't so well. I got toothache."

William : " Swank ! "

OUR CHILDREN'S TEETH.—What of the children upon whom the future rests ? Sir George Newman estimates that "not less than half of the six million school children in England and Wales are in need of some dental treatment—a substantial number urgently so." With this may be bracketed the statement of an Assistant School Medical Officer at Sheffield : "I have been much struck during my short experience with the extraordinary extent of dental decay affecting the milk teeth of children. A perfectly healthy set of teeth in a child aged six is practically non-existent, while in three out of every four children four or more teeth show well-marked decay."

In the face of statements like these we can but bow our

heads in shame. If the problem is to be effectively grappled with and solved, treatment must obviously take a second place to preventive methods. These should include every sort of educational propaganda, not omitting the lantern and cinema. The hygiene of the mouth must be systematically taught in the schools¹ and illustrated by experiments, such as Councillor G. P. Holden found so effective at Darwen. We must go yet further back and show the pregnant and nursing mother how decayed teeth in her case may poison her child.

PENNY WISE, POUND FOOLISH.—We are told, however, that this great nation is so impoverished by the war that it cannot afford to do its duty to its future citizens. Such “educational parsimony” is dismissed by the Bishop of Manchester, Dr. Temple, as “sheer lunacy,” and by a number of great employers as “a peculiarly short-sighted form of extravagance.” If pleas of justice and wisdom do not suffice, it may be observed that money spent upon the teaching of food values, hygiene, and on medical inspection and treatment, besides giving a return for the sums laid out on education, will be money saved on drugs, hospitals, asylums, prisons, workhouses, etc.² It will also make for that consummation, devoutly to be wished, of greater skill and intelligence, leading to increased production. Moreover, if the depreciation in money values is taken into account

¹ Among the questions addressed by the Food Education Society to candidates at Parliamentary and local elections in 1918–19, were the following :—

HEALTH AND TEMPERANCE.

8. i. The laws of health, temperance and domestic well-being, including the elements of food values, and the care of the mouth and teeth shall be taught to every boy and girl, as well as to members of Continuation Schools.
- ii. Personal and School hygiene and elementary physiology to be made obligatory subjects for all candidates for posts in Secondary schools (as they are already for those passing through English Training Colleges to Primary schools and for all students in Scotland).

The complete series may be obtained by sending 2d. to the Society at Danes Inn House, 265, Strand, London, W.C.2.—Ed.

² “The Act of 1918,” says Mr. Spurley Hey, “gives to physical and social training, as important a part as mental development.”—Ed.

we are actually, as Mr. R. H. Tawney has shown, spending less on education¹ than before the war. An equally strong case can be made out against the curtailment of work for maternity and child welfare.

THE MANCHESTER CONFERENCE.—The gathering at Manchester in May, 1920, was not merely the first of its kind ; its composition was indicative of the many-sided appeal made by the subject of dental disease. The personnel of the Conference included doctors, dentists, nurses, scientists, educationists, welfare workers, social reformers ; even the “man in the street” was represented. The promoters were singularly fortunate in securing the co-operation of some of the highest authorities. These, in their turn, dealt with their allotted tasks, as desired, in a popular rather than a technical manner. As a result the discussions, besides maintaining a high level of interest, were, for the most part, intelligible to the rank and file of the members and visitors.

CONCLUSIONS.—What, if any, conclusions were arrived at from the two and a half days’ flow of talk ? It was shown that dentists, like doctors, differed, and that controversies such as the part played by “constitutional and predisposing causes” have yet to be solved. There was, however, a large measure of agreement on fundamentals. Thus, there were no two opinions that the teeth of the British people were, in Sir William Milligan’s words, “in a deplorable condition,” that much serious disease of other parts of the body originated in the mouth, and that some nine-tenths of dental disease was, as Dr. Harry Campbell contended, preventable by the adoption of suitable diet.

Certain other principles found general, if not universal, acceptance. These included :—

Mastication, or dental gymnastics.

Sufficiency of natural methods of mouth hygiene—*i.e.*, the mouth must be kept, in Dr. Sim Wallace’s phrase, “physiologically clean” by the practice of mastication, by the correct ending of meals, and by rinsing regularly after them.

On this last head the words of the late Sir William Osler,

¹ £10 per adult head was spent in 1920 on drink, £5 on tobacco, £5 10s. on pleasure motoring, as against £2 4s. per head for education.—Ed.

MANCHESTER CONFERENCE CONCLUSIONS 7

quoted by Dr. Adami in his inaugural address at Manchester, may be recalled : " You have one gospel to preach, and have to preach it early and late, in season and out of season. It is the gospel of cleanliness of the mouth, cleanliness of the teeth, cleanliness of the throat. These three things must be your text through life."

Condemnation of :—

1. A pappy diet, alike for little children and for those of riper years.
2. Excess of carbohydrates and sugar.
3. Faulty selection of food, *e.g.*, impoverished, refined, and adulterated flour, rice, oatmeal, barley, etc., and their sale to the public without warning.
4. Unscientific and wasteful cookery.

It was admitted that Government action during the war in regard to flour, as well as to the eating of crusts had had beneficial effects upon the public health, and that its relaxation was a misfortune.

If there was not the same unanimity as to the part played by the corresponding restrictions in the supply of sugar,¹ it was allowed by most that excess of this luxury article and of sweets had much to answer for. The diminished consumption of milk may, according to Dr. Wheatley and others, have been a contributory factor.

TOOTHBRUSH CONTROVERSY.—The toothbrush came in for severe handling, though it did not lack support, both qualified and out-and-out. It may, however, safely be predicted that its unquestioned supremacy as a preventive agent is gone for ever. Apart from the injury inflicted by it as ordinarily used, there was much testimony that regular brushing of teeth did not ensure entire immunity, nor did neglect in this respect inevitably produce decay. It was therefore not surprising to hear from Manchester some days later that " the toothbrush controversy is still raging."

The discussions incidentally brought out the connection existing between rickets and dental disease, thus giving an added appropriateness to the suggestion made for the holding of another Conference on the former subject.

¹ See *Why Worry about Sugar?* 1d., and *Facts for Patriots*, 2nd series, 4d.

KEYNOTE OF THE CONFERENCE.—The keynote of the gathering was prevention. "The first duty of medicine," to quote Sir George Newman's epoch-making words, "is not to cure disease, but to prevent it."¹ We must, however, deal with matters as we find them, and cannot expect to be relieved of the consequences of our sins of commission and omission, with those of previous generations, in the twinkling of an eye. It follows that Dr. Harry Campbell's playful remark, "I do not really care much about Dr. Adami's dentists," must not be taken too seriously. Some day, and at no distant time, if we go to work in the right way, dentists may largely, if not wholly, be dispensed with. In the immediate future, however, the profession is to be regarded as "one of the outposts of preventive medicine,"² and its status needs to be raised. We look to it, in conjunction with the medical profession, to lead us in the campaign. Let us concentrate on saving the teeth, the health and the lives of the next generation. In treating children, as well as their mothers, we should act on the principle that "a stitch in time saves nine," and make as early a start as possible. The chief work will have to be done in schools of all kinds, though movements such as Girl Guides, Boy Scouts, Schools for Mothers, Infant Welfare Centres, and, in the country districts, Women's Institutes, should bear an honourable part.

DANGER OF DOGMATISM.—In the Introduction to *Our Children's Health at Home and at School*, 1912, and *Rearing an Imperial Race*, 1913, the writer ventured to take stock of the position in the medical profession and of the prospect of reform. In the former, the *Times* and *Westminster Gazette* were cited as to the undesirability—not to say shortsightedness—of any attempt on the part of the doctors to lay down the law to the public. What is sauce for the goose is sauce for the gander, and after joining in the chorus of condemnation

¹ Present methods were concerned largely with disease as an entity, not with health invaded by disease. Energies were being bent upon tasks, of which it could only be said that they were of the character of salvage. . . . The demand arose for the teaching of preventive medicine and curative medicine. . . . Medicine, in General Smuts's phrase, has "struck its tents and is once again on the march." The Medical Correspondent, *Times Educational Supplement*, October 7th, 1920.—Ed.

² Report of the Committee on the Dentists Act, 1919.

of dogmatism in the medical profession, it would not be consistent to condone it in the dental.

A RESULT OF THE GREAT WAR.—A year later, under the influence of the International Medical Congress, a hopeful view was taken of the manner in which new ideas were making headway. The Great War, if it upset the normal rate of advance, has in certain directions quickened the pace. Desperate diseases call for desperate remedies, and there has been manifested an increasing disposition to break down the bonds of the conventional and orthodox and to maintain an open mind. This is, indeed, the true scientific attitude, and the need for its cultivation was again and again emphasised in the course of the proceedings at Manchester. Meanwhile, the stressing of points of agreement rather than of difference and the display of a spirit of broad tolerance is much to be desired. There is room, too, as Mrs. Mellanby suggested and Dr. Sim Wallace has urged, for closer co-operation between doctors, dentists, and physiologists on the one hand, and educationists and social workers on the other.

NEED FOR RESEARCH.—The differences which manifested themselves in the discussions point to the need for more research, especially with a view to ascertaining the respective share of such factors as environment (including diet), habits, heredity and disease, and, again, the nature of the enamel and how far the teeth are able to resist acid and other adverse influences.

REVOLUTION IN DIETETICS.—Food and food values have hitherto played a miserably small part in the medical curriculum.¹ A cynic might say it was just as well, seeing that recent discoveries, such as that of vitamins, make it necessary for us to scrap much of our hardly acquired knowledge and to revise our theories to fit existing facts.

“It seems,” writes Dr. Edward Mellanby,² “but yesterday

¹ No medical student can qualify in New Zealand without having passed through a course and an examination in elementary dental surgery. This does not comprise the teaching of operative dentistry, but does comprise the teaching of the far-reaching effect of dental ills. My friend Dr. Kirk thought it must be rather a bitter pill. On the contrary, the students take up this course with the greatest enthusiasm, and I have been impressed at the manner in which they passed their examinations.—Professor H. P. Pickerill, M.D., M.D.S., L.D.S., University of Otago, Sixth International Dental Congress, 1914.—Ed.

² *Time and Tide*, February 25th, 1921.

that dietetic experts regarded the animal body more or less as an ordinary engine. The body had to be stoked with food for the same reason as furnaces had to have coal before steam could be produced. Almost any food that an animal could eat and oxidise, and thereby derive energy, was considered compatible with healthy existence. Foodstuffs which on oxidation supplied the same amount of energy were considered as of equal value to the body. It would be wrong to say that these views were universally accepted, but it is true that, apart from some consideration given to the amount of proteins that should be eaten, all attention was focussed on the *amount* of food ingested. In the rationing both of troops and the civil population of all countries during the war, attention was fixed on (a) energy of diet, (b) its protein contents.

“These ideas of food must now disappear, not because they are wrong but because they are only parts of the truth. It is important that an individual should get a sufficient quantity of food, but it is even more important that its quality should be satisfactory, if good health is to be maintained. For although the body has a wonderful capacity to adapt itself to a diet deficient in energy, it rapidly becomes an inefficient structure when the quality of food is wrong. This new point of view of dietetics is largely due to the discovery of vitamins.”

At the same time the tendency to exaggerate the consequences is to be deprecated. Provided that a reasonable amount of variety is available, there need be no fear that the infinitesimal, yet indispensable, quantity of “the accessory food factors” will not be forthcoming.

A CALL FOR UNITED EFFORT.—An incidental result of the new learning, which reacts on the problems alike of the medical and dental professions, is to bring them closer together. This is all to the good. The appalling incidence of disease of the teeth, which is playing havoc with our health, efficiency, and prosperity, imperilling our very existence as a race, can only be reduced by a supreme effort. In this not merely doctors and dentists, but employers, teachers, social workers and the public must bear their part.

HOPEFUL OUTLOOK.—Grave as the situation undoubtedly is,

there seems good ground for sharing the optimism of Miss Florence Petty and Dr. James Wheatley at Manchester, as to the prospect of rapid amelioration when once the tide is turned. In the campaign of education the Food Education Society has already, through the written and spoken word, "done its bit." It is ready to place at the disposal of the public its accumulated experience. In this arduous task the Society confidently looks for encouragement and financial support to those alive to its urgency.

SCHOLARSHIPS AND PRIZES.—The case of students for the medical and dental professions must not be overlooked. It is in the highest degree desirable that their attention, at an early stage in their career, should be turned in the right direction. This object could be attained not merely by an amendment of the curriculum,¹ but by the offer of prizes and scholarships for research in dietetics and oral hygiene. The suggestion applies in hardly a less degree to students of domestic science, to would-be school and hospital nurses, and to those preparing in the training colleges for the teaching profession generally. In the primary schools hygiene has, indeed, long been a compulsory subject.

Such offers of scholarships and prizes constitute one of the stated methods of the Society, whose treasurer, Sybil, Viscountess Rhondda, will be happy to receive gifts or promises, large and small, to enable it to give effect to the proposal.

TRIBUTE TO A PIONEER.—A few weeks before the Manchester Conference there passed away in that city, in his 86th year, a pioneer whose services merit acknowledgment here. It

¹ There were three principal reasons for the increase of dental caries—namely, that until recently no public body had considered the prevention of the condition; the medical profession, which was the adviser of the public on all questions of personal hygiene, has been profoundly ignorant of this matter; while the dental profession had not come in contact with the people as a whole, and, generally speaking, had not been engaged in preventive works. A knowledge of the hygiene of the mouth should form part of the training of every medical man, so that he should thoroughly understand the effect upon the teeth of every deviation from physiological living and of pathological conditions, and also the effect on general health of diseased conditions of the mouth. Dr. James Wheatley M.O.H., and S.M.O., Shropshire, joint Public Health and Dental Sections, British Medical Association, Birmingham, July 28th, 1911.—Ed.

was Mr. Sedley Taylor, who founded in 1907, at Cambridge, a free clinic in dentistry, the first, it is believed, in England. The following letter from a distinguished Manchester citizen and Conference member, Mr. T. C. Horsfall, sheds an interesting light on the origin of the gift :—

“ It is a great pleasure to me to be able to believe that I was the ‘ occasion ’ of Sedley Taylor’s giving to Cambridge its dental school clinic. He had been staying with us here, and I had shown him a number of German accounts of the results obtained in schools by having the children’s teeth regularly examined. He was so much impressed that he resolved to make the doing of similar work possible in Cambridge.”

It is a melancholy satisfaction to recall that only a day or two before his death a gift in aid of the general work of the Society was received.

A TIMELY VOLUME.—The book makes its appearance at an opportune moment. Mr. Fisher, like his predecessor at the Board of Education, has recognised in his great Act the physical basis of education. The war has enforced this lesson through the terrible toll taken and the disquieting disclosures of the recruiting officers. The setting up of a Ministry of Health and the coming into operation of the Education Act, which affords for the first time an opportunity of influencing the health of adolescents, and subjects all secondary schools to medical inspection, supplies additional ground for hopefulness. The suggested revision of the medical curriculum and the imminence of legislation affecting the dental profession, as well as on such matters as patent medicines, milk, and—would that it could be added—bread, should facilitate and hasten reform. Last, though assuredly not least, the Manchester Conference provided an occasion for considering exhaustively the dental problem, and always from the point of view of prevention.

Over and above these grounds for optimism, the new developments in public health work inaugurated by the International League of Red Cross Societies, and the manifold activities in the same sphere foreshadowed by the League of Nations, give a world-wide rather than a national significance to the campaign.

CAUSE OF DELAY.—The year's delay in the appearance of the volume is attributable in part to a sudden and urgent call to the writer to undertake the organisation of the Housing Bonds Campaign in Hampstead, in part to that "lack of pence which vexes" societies no less than public men. This is peculiarly true of bodies like "The Food Education Society," whose work is not merely remedial but preventive. Such activities are less showy, but more economical and of far greater permanent value to the community.

A LAYMAN'S APOLOGIA.—"Fools rush in where wise men fear to tread," and in the fulfilment of an arduous task I have, as a layman, found myself frequently out of my depth. Circumstances have, however, been too strong for me, and to shirk so obvious a duty would have been cowardly. I can but crave the sympathy of readers, especially members of the medical and dental professions. Such generous indulgence has been extended to me in the past by their leaders, who have entirely overlooked my lack of professional training, that I am hopeful that the rank and file will condone the manifest deficiencies of the volume.

ACKNOWLEDGMENTS.—Warm acknowledgments are due to Drs. Harry Campbell, Chairman, Education Committee, Food Education Society; Ralph H. Crowley; Montague Dixon; T. N. Kelynack; W. St. C. McClure, Chairman, Manchester Committee; James Niven, Medical Officer of Health, Manchester; and C. W. Saleeby; Messrs. William Fisk, President, School Dentists' Society; Montagu Hopson, ex-President, Robert Lindsay, Dental Secretary, British Dental Association; and H. W. Norman, L.D.S.; Miss Marion FitzGerald; Miss Landel Jones, Superintendent, Argyle Square, King's Cross, Infant Welfare Centre; Miss May Lennard; Miss Florence Petty, "The Pudding Lady;" and Mr. T. Lomax, for kind help and encouragement, as well as to the Earl of Dysart, Mr. G. P. Gooch, Mrs. Edward Hecht, Mr. T. C. Horsfall, Miss Flora Woolridge, and others for generous financial aid, without which the book might never have seen the light.

The smooth running of the wheels of the Manchester Conference was in no small measure attributable to the organising ability and local knowledge of Miss Rita Klein,

while this book owes much to the sympathy, interest, and aid of her successor as Assistant Secretary, Miss Natalie O'Meara. Thanks are also due to Mr. J. T. Willington for his admirable report of the Conference, and to Mr. Ellis Benson for the attractive appearance alike of the invitation and programme. An equal meed of acknowledgment is owing to Mr. Cuthbert Wilkinson, Miss Barbara Moore, and the St. Catherine Press, whose unremitting solicitude has seen to it that the letterpress and form of the book shall be such as will stimulate the demand.

CHAS. E. HECHT.

Danes Inn House,
265, Strand, W.C.2.
May 9th, 1921.

PART I

THE CALL TO ACTION

(A) *A GRAVE INDICTMENT*

SOME HARD FACTS.

(LEAFLET No. 1.)

[THE two succeeding items were intended, had circumstances permitted, to be issued as leaflets prior to the Manchester Conference. The first was designed to form and educate public opinion in general and the Press in particular; the second for circulation among Medical Officers of Health, School Medical Officers, their staffs and social workers. They are included here as helping to frame the indictment against things as they are. Should the demand warrant it, either, or both, will be issued as leaflets.—Ed.]

AN OFFICIAL PRONOUNCEMENT.—“There is no question that the teeth of the people have become much worse of late years and in many parts of the country may now be described as very bad. On this point there is no difference of opinion, though the acuteness of the evil is said to vary much and may in some cases be affected by local causes.”

A CAUSE OF DEGENERATION.—“Though it [dental disease] is not an indication of degeneration, it contributes to the causes that produce it by the poison that dental caries introduces in the system and the gastric troubles that follow therefrom.”

Inter-Departmental Committee on Physical Deterioration Report, presented to Parliament by command of His Majesty, 1904.

A COLONIAL IMPRESSION.—“Stooped shoulders, hollow chests, ash-coloured faces, lifeless eyes and, ghastliest of all, loose-set mouths with bloodless gums and only here and there a useful tooth—those toothless mouths of men and women and children told the story. One touch of disease made the whole crowd kin.”

J. A. McDONALD, “Britain’s Gravest Problems,”
The Toronto Globe.

WHY NEW ZEALAND NEEDS A CAMPAIGN.—“Mr. Carter, at the New Zealand Dental Association Dinner, 1916, attended by the Ministers of Health and Education, said: ‘If the deplorable conditions of the mouths of the children of the public schools were not attended to, and steps taken to meet the evil that existed, the result would be national degeneracy of a very pronounced and aggravated type.’ The examination of recruits for military service, and the enormous percentage of rejections of the young manhood of the Dominion for unfitness, together with the results of the dental and medical examinations of the children of our schools, has opened the eyes of the man in the street to some extent to the need of something being done.”

RICHMOND DUNN, L.D.S., *New Zealand School Medical Service*, 1920.

AN UNSUSPECTED SOURCE.—“Defective teeth are the source of many serious general diseased conditions. The septic conditions are an exceedingly common cause of irritation and inflammation of lymphatic glands, which often become tubercular. They are a fruitful source of gastric and intestinal troubles in later life, of chronic anæmia, and of severe and persistent neuralgia and headaches.”

Chief Medical Officer, the Board of Education, Annual Report, 1904-5.

ONE OUT OF NINETY-SEVEN.—“In the examination of ninety-seven candidates for employment under the School Board, one-half of the men required to wear plates, one-fifth of the remainder had teeth that might be classed fair to poor. One-third of the women had to wear plates, one-third had good teeth, and one-third were fair to poor. Of the total, only one had perfect teeth.”

Aberdeen School Board, Fifth Annual Report on Medical Inspection, 1914.

SOME OF THE CONSEQUENCES.

THE PART OF JAWS AND TEETH.—“No race or family can remain great, or even perpetuate itself, if it fails to develop properly and give due exercise to jaws and teeth. The whole

organism and every function of body and mind is ultimately dependent, not only on what the mouth delivers to the stomach, but on the complete grinding and mixing with saliva of every morsel of food before it is swallowed."

F. TRUBY KING, C.M.G., M.B., *Feeding and Care of Baby.*

THE BEAUTIFUL MOUTH GOING.—"We are becoming an ugly nation, the round, well-balanced face giving place to the long, thin one. If the jaws are correct the face is firm and well balanced, the teeth would probably articulate correctly, and the curves of the mouth would be beautiful. How many people one meets in the streets fail in these particulars. The President of the Society of Miniature Painters bewailed the fact that the beautiful mouth was disappearing. The artist attributed it to the strenuous modern life. I attribute it to mouth-breathing."

WILLIAM RUSHTON, L.D.S., *British Dental Association, August 5th, 1911.*

NAPOLEON'S SAYING RECALLED.—"Napoleon said that an army moved upon its belly, and it may be added that its motor members are its teeth. Bully beef and hard tack require good grinders, and the lack of them cannot be made up by an improvised Ministry of Munitions. What is true of war is true also of peace. The health of the nation lies in good digestion, and there is no good digestion (save in babies) where there are no teeth. Yet many of the people are toothless, and it is no wonder that the call of the insured patient upon his doctor is heavy."

British Medical Journal, December 20th, 1919.

COMPARISON WITH ALCOHOL.—"We find that 99 per cent. of the working-men that we examine at the Life Extension Institute in New York City have something definite the matter with them, something that might be bettered. Sometimes it is merely defective teeth. Yet Dr. Fisk, Medical Director of the Institute, believes, and he thinks exactly as I do on this alcohol question, that bad teeth are doing just as much harm to the people of the United States as alcohol, and that the poisons that are absorbed from the roots of the teeth when they are diseased are just as injurious in the long run as alcoholic poisoning. They do not intoxicate in the

same acute degree, but they paralyse the working power and shorten life as much."

PROFESSOR IRVING FISHER, *Public Health in War Time*, 1917.

PREVENTABLE ILLNESS AND DEATH.—"Having regard to the large amount of preventable sickness and chronic invalidity terminating, in many instances, in premature death, which results from the effect of oral sepsis and decayed teeth, the Committee view the facts which have been brought to their notice with the gravest concern. They are of opinion that the state of affairs revealed should receive early attention, with a view to the improvement of the health of the nation and an increase in its industrial efficiency."

Report of Committee on the Dentists Act, 1919.

A DEBILITATING CONDITION.—"Nobody who has for their life's work the preservation of the health of the people generally can fail to be impressed with the large amount of harm that is done by defective dentition at the present time. . . . I have no hesitation in saying that neglect of teeth is everywhere evident" (among the masses). . . . "Life is shortened and probably minor ailments are produced. These induce other diseases, so that although you do not get a man dying from something wrong with his teeth, you get him dying from tuberculosis or pneumonia or bronchitis, or anything else, at an earlier age than he otherwise would have died at, by reason of the fact of the defective condition of his teeth. It is a debilitating condition."

DR. JAMES ROBERTSON, *Medical Officer of Health*, Birmingham, 1919.

SICKNESS AND THE TEETH.—"Some of the replies from the Manchester Insurance Committee's medical panel expressed very strongly the writer's opinion that much sickness was due directly to want of teeth. The replies read as a whole leave no doubt in the reader's mind that a large amount of preventable illness among insured persons in Manchester is to be ascribed to neglected teeth."

British Medical Association Statement, Committee on the Dentists Act, 1919.

ATTEMPTING THE IMPOSSIBLE.—“There are no finer children at birth in the world than the British, whether it is the poor man's child born in London, or the rich man's child born in the country. They are the inheritance of a fine race, and the inheritance has not yet died out. Their teeth, however, are ruined to begin with, and you cannot raise a nation on rotten teeth, though that is what we are trying to do.”

SIR JAMES CANTLIE, K.B.E., *March 2nd, 1921.*

HUMILIATING ADMISSIONS.—“Out of six million children on the registers of Elementary Schools in England and Wales, no less than half, or three million, are in need of dental treatment, and no less than 500,000 urgently so.”

SIR GEORGE NEWMAN, K.C.B., M.D., *Memorandum, Committee on the Dentists Act, 1919.*

CIVILISATION AND DENTAL DISEASE.—“The decay of the teeth in civilised countries was estimated at 90 per cent. of the children. This percentage had already been reached in London and was rapidly becoming reached in the country and also in America and on the Continent. In India, Africa and other parts, where people lived on simple diet, it was found that they had better teeth.”

Reports, International Dental Federation, 1911.

POVERTY AND BAD TEETH.—“Dental caries increases in direct ratio with the wealth of the parents; the poorest children, as a rule, have the best teeth.”

DR. GERSON STEWART, *Medical Officer of Health, East Suffolk County Council.*

“The Government had passed a Bill to prevent little boys smoking. If they had brought in one to shut up sweet shops they would have done more good for the country.”

SIR FRANK COLYER, L.D.S.

NO GREATER HANDICAP.—“It is probably true to say that there is no single ailment of school children which is responsible, directly or indirectly, for a larger proportion of the delicacy and disease (including constitutional disease) which is found at every turn to handicap efficiency, both physical and mental. If the children with somewhat defective teeth and with grossly defective teeth be added together, the

total percentage gives in 'typical areas' a proportion of from 52 to 99 as defective and requiring treatment."

Chief Medical Officer, the Board of Education, 1910.

"The dental problem remains, after ten years of the school medical service, one of the most important, urgent and difficult. All over the country there is prevalent a high degree of dental defect, deleterious in itself and far-reaching in its injurious effects on the health of children, adolescents and adults. The problem stands in the front rank of the questions of preventive medicine."

Chief Medical Officer, the Board of Education, Annual Report for 1918.

ECONOMIC ASPECT OF DENTAL DISEASE.

HEALTH AND INDUSTRIAL EFFICIENCY.—"The health, and with it the industrial efficiency of the future adult population of the Kingdom, largely depends on the preventive dental work which will be carried out in the schools in the immediate future."

Report of the Committee on the Dentists Act, 1919.

"Neglect of teeth trouble is the cause of quite half of the ill-health found among the industrial classes, and of these a large majority in young women."

Medical Referees of Prudential Approved Societies (membership, 3,000,000), 1919.

"A considerable economic loss arises from the effect of dental disease, owing mainly to the reflex influence thereof on the general bodily health, particularly through digestive trouble and resulting anæmia. The effect is most noteworthy in women."

British Medical Association Statement, Committee on the Dentists Act, 1919.

VALUE FOR MONEY.—"It has been estimated that 70-80 per cent. of children's illnesses are primarily due to carious teeth, to which therefore 75 per cent. of the attendances lost by children may be attributed. The consequent loss in grants may be somewhat appreciated. Caries is a progressive destructive disease—a carious child becomes a more

carious adult and is accordingly handicapped in the struggle for existence."

DR. J. G. W. BOLEYN, *Assistant School Medical Officer, Durham County, 1913.*

PENNY WISE, POUND FOOLISH.—"Neglect in childhood especially has cumulative results. It led to malnutrition and to great loss to the individual and the community. Many of the approved societies were quite convinced that the drain on their funds would be diminished very much if there was adequate dental treatment for adults. He strongly represented that if the nation spent its money in providing dental treatment, it would be an economical investment. The nation would get it back" (in Mr. Anderson's words) "in respect of good health, better workmanship, better work, less sickness and so on, all of which surely are vital to the nation."

The late W. C. ANDERSON, M.P., *before the Committee on the Dentists Act, 1919.*

YET MORE FACTS

(LEAFLET NO. 2.)

GATEWAY TO HEALTH OR DISEASE?—"Decay of the teeth is not a mere chance unfortunate disability of the day—it is the most urgent and gravest of all diseases of our time—a more serious national scourge than cancer or consumption; indeed, these and other diseases would be best attacked by establishing the strength and resistiveness of the whole human organism, of which the mouth, jaws, teeth and nose are the gateways—the gateways to health or disease, according to our choice."

F. TRUBY KING, C.M.G., M.B., "The Story of the Teeth."

CRIPPLING MORBIDITY AND INVALIDISM.—"The time has more than come for taking further steps in the organisation of a systematic and ordered attack on the strongholds of preventable disease—particularly that mass of crippling morbidity and invalidism which is undermining the capacity and efficiency of the people—an attack which will depend for its achievement upon a close partnership and co-operation between all branches of medicine, between the medical

A GRAVE INDICTMENT

profession and the public and between the governing authorities and those who are governed."

SIR GEORGE NEWMAN, K.C.B., M.D., D.C.L., F.R.C.P., "An Outline of the Practice of Preventive Medicine," 1919.

THE HEALTH TOLL.

A FOUNTAIN OF DISEASE.—"I tried to make out how many diseases are supposed to be caused by oral sepsis. The number is appalling, amounting to at least twenty-six."

SIR RICKMAN GODLEE, Bt., K.C.V.O., Past President R.C.S., Eng., *Sixth International Dental Congress*, 1914.

A DAMNING INDICTMENT.—"Decay of the sockets, a disease from which nine-tenths of the inhabitants of the British Isles over 20 years of age suffer."

DR. HARRY CAMPBELL, *National Food Reform Association Annual Meeting*, July, 1909.

CAUSE AND EFFECT.—A doctor at a big New Zealand Hospital remarked:—"There is no doubt that people who come here for treatment for appendicitis do have most shocking teeth."

F. TRUBY KING, C.M.G., M.B., *International Medical Congress*, 1913.

FAR-REACHING RESULTS.—"The chief sequelæ of dental caries and oral sepsis are found to be (in the following order of importance):—

"(a) General debility (the starting point).

"(b) Anæmia (especially in young women).

"(c) Rheumatism, including premature senility, myocardiac and arterial degeneration (in older people, especially men).

"(d) Gastric troubles, including chronic gastritis and ulcer, appendicitis and chronic constipation.

"(e) Neurasthenia.

"These conditions, a-e, often co-exist, in fact, as a rule, two or more of them are present in all cases, and it is rare to find a patient suffering from oral sepsis who is not also neurasthenic to a greater or lesser degree. . . .

"A large number of diseases of auto-intoxication, such as

Graves's disease, must undoubtedly count oral sepsis as an etiological factor in their incidence."

Statement by Prudential Approved Societies (membership, 3,000,000), 1919.

A CAUSE OF TUBERCULOSIS.

"Failure to take care of the teeth causes malnutrition and feeble development, anæmia, etc., and paves the way for tuberculosis. Tubercular germs accumulate in bad teeth and in the mouth and offer the most fertile soil for the growth of the tubercular virus. Caries of the teeth is universally prevalent among children and is indirectly the cause of many infectious diseases of the jaws and the glands and weakens the powers of resistance against tuberculosis."

PROFESSOR MULLER (*Lung Specialist*), *Dental Congress*, 1911.

"The Birmingham City Council had appointed a dentist in connection with its tuberculosis work, as it had been found that many such cases had bad teeth—more so than the average population. The defective teeth of young adults were one of the debilitating causes which induced tuberculosis. It was quite likely that the tubercle bacilli gained access to the throat through defective teeth, and it was only by having the teeth attended to that the real benefit from sanatorium treatment became available. As regards the relationship existing between bad teeth and various forms of intestinal sepsis and internal disorders, which are unduly prevalent in Birmingham, colitis, appendicitis, duodenal ulcer and various things like that may be due to defective teeth."

DR. JAMES ROBERTSON, *Medical Officer of Health, Birmingham, Committee on the Dentists Act*, 1919.

"Amongst consumptives of the working classes, deficient dentistry and septic mouths are very commonly met with. These conditions prejudice the prospects of recovery and almost certainly are a predisposing factor to infection with tuberculosis. . . . Ignorance and indifference as to the care of the teeth is a large factor."

DR. NOEL D. BARDSWELL, M.V.O., *Medical Adviser to the L.C.C.*, 1919.

"About one in every fifteen deaths in Lancashire was due to tuberculosis of the lungs. Half the defects in the throat, nose and ears that called for the attention of the specialist could be avoided if children were only made to attend to their noses at an early age and to their teeth."

SIR CHARLES BROWN, M.D.

LOSS IN MONEY.

SOME STATISTICS.—"Statistics in reference to school children showed that there were, on the average, from six to nine teeth decayed or lost in each mouth. The number decayed or lost was much greater as age advanced, so it could be calculated that there were between 250 and 500 million teeth decayed or lost among the 40 millions who inhabited these islands. If we estimated the value of a sound tooth compared with a diseased one at £1, we came to realise that the loss to the nation from decayed teeth alone was represented by hundreds of millions of pounds sterling. During the South African War 2,451 soldiers were invalided home on account of defective teeth, representing a loss to the nation of £100,000."

DR. SIM WALLACE, *International Medical Congress*,
1913.

DRAIN ON BENEFIT FUNDS.—"There can be no doubt that there are thousands of persons receiving sickness benefit who would not be doing so had they received proper dental treatment."

Report of the Committee on the Dentists Act, 1919.

"The absence of any provision for dental treatment—a possible additional benefit in the event of a Society realising a surplus—has produced much sickness at various times resulting in a drain on the sickness benefit fund. . . . Inattention to teeth results in certain cases in prolonged gastric illnesses, and in a very large group of cases, on which benefit is being paid, no permanent cure is possible until the teeth have been attended to."

*Departmental Committee on Sickness Benefit Claims.*¹

¹ Cd. 7187.

PREVENTION VERSUS CURE.

THE ONLY WAY.—"Medical benefit under the Insurance Act provided floods of 'physic,' and gave official sanction to the 8-oz. bottle fetish, but beyond a limited endowment of research, it did nothing to prevent disease and nothing at all to prevent the dental dilapidation of the race, which is at the bottom of so much incapacity, suffering, and waste."

A MEDICAL CORRESPONDENT, *Manchester Guardian*,
August 5, 1919.

"By no means sufficient consideration has been given to the question of prevention. If we are to obtain an improvement in the condition of the teeth of the nation, it will be by teaching the individual to prevent the condition and not to rely upon a cure. One trouble is the indifference of the majority to the question of dental disease, and this can only be overcome by widespread propaganda on the harm which arises therefrom. The establishment of free public lectures and the issue of a small pamphlet written in popular language would prove of inestimable value. By this means the amount of disease would be considerably lessened and there would be a corresponding diminution in the amount of conservative dentistry required. There is greater need to deal with those under school age, for in the children of the masses irretrievable damage has often been done to the teeth before school age."—*Lancet*, August 23rd, 1919.

AN OUTPOST OF PREVENTIVE MEDICINE.—"The Dental Profession should be regarded as one of the outposts of preventive medicine and as such encouraged and assisted by the State."

HOW TO SAVE THE TEETH OF THE PEOPLE.—"If it be accepted that it is the duty of the State to ensure in the national interest that its citizens shall be maintained in a state of good health and working efficiency, we have no hesitation in stating that adequate arrangements for keeping the teeth of the people in a sound condition are one of the essentials to this end. There is no doubt from the evidence submitted to us that, provided an adequate and periodical dental inspection, supplemented by conservative treatment of the teeth of the people, could be ensured, the gain to the community

both in improved health and in increased efficiency in labour, both manual and mental, would be very great."

Report of the Committee on the Dentists Act, 1919.

WHAT THE CAMPAIGN HAS REVEALED.—"We have reached, as it seems to me, the end of the first stage of the pioneering work of the School Dental Service. The prevalence of dental caries in children of all ages has now been abundantly confirmed by the discovery of the wide prevalence of dental disease in insured persons and in soldiers, and the need of organised treatment is demonstrated beyond question.

"It is conclusively proved that if the teeth and mouth of the child are maintained in perfect health, the amount of dental attention subsequently needed is greatly reduced. Hence school dentistry is largely prophylactic and preventive."

Chief Medical Officer, the Board of Education, 1918.

SHUTTING THE STABLE DOOR.—"School dentistry came in like a fire brigade to a fire that was already well alight. Mrs. (now Lady) Leslie Mackenzie had pointed out that school medical inspection was made too late, that the children were found to have already developed nose, ear and throat troubles and chronic bronchitis, which when traced back would often be found to be due to neglected measles or whooping cough. That exactly applied to school dentistry. If the mouth were made functional at an earlier age, so that the child never lost the habit of chewing its food, it would be real prevention. The ideal was treatment at two and a half or three years of age."

GEORGE THOMSON, L.D.S., *Sixth International Dental Congress, 1914.*

DEATH OR VICTORY?

A CHEERING ANALOGY.—"By far the commonest complaint is defective teeth. In some of the districts the children with satisfactory teeth do not number as many as 20 per cent. . . . The medical evidence seems to be that defective teeth are largely due to an unwise diet. . . . Competent observers tell us that within recent years the number of open windows both in living and in sleeping rooms, in country cottages as well as in town houses, has been multiplied many times. This

habit of better ventilation has been induced by the spread of knowledge as to the benefits of fresh air, and this knowledge has been spread mainly by the direct teaching of schools, by doctors and nurses. Similarly, a knowledge of the importance of hygienic diet may be rapidly disseminated.¹ I will not, however, enter upon the controversial topic of articles of food deleterious to the teeth."

An Inspector—Report to the Scottish Education Department.

A DISTINCTIVE TYPE.—"Southport appeared to be developing a large percentage of children of a distinctive type: broad-faced, with eyes well apart and alert, nose fully grown and set at a proper angle on the face, air passages fully developed, especially as to their bony framework, nostrils mobile and dilated—an evidence of force—wide dental arches, and the teeth of the upper and lower jaws in apposition, mouth large and firm, with all the muscles of expression in full play, lower jaw square, whilst the chin, upper jaw and forehead are in line, and with good symmetry of head, body and limbs."²

(Southport was one of the first authorities to adopt school health visitors over ten years ago and a school dentist.)

DR. MALCOLM PARKINSON, *Report to the Southport Education Committee, May, 1920.*

¹ Cf. p. 241.

² "Instead of the idea once prevalent that we are doomed eventually to be a toothless people, we look forward with every belief in the ultimate conquest of the disease. We see a future people free of it and marvelling that those of to-day could have suffered so long and so patiently. We imagine them asking themselves what strange perversity could have filled the mind of people who were willing to spend thousands, nay millions, of pounds a year on the cure of a disease, upon discovering the cause of which they would not spend a penny. Can we wonder at them if they think thus? For everywhere we see signs of this dreadful malady; it ruins the beauty of many, it enfeebles those who would be otherwise healthy, it helps to fill the workhouses and poor infirmaries with preventable sickness, it is the direct and indirect cause of a waste of fabulous sums of money."—Dr. Sim Wallace, *The Prevention of Dental Caries*, cited by Dr. Wheatley, March 25th, 1918, who adds: "I do not think the statement exaggerated, nor the forecast unwarranted."—Ed.

COMMON PREVENTABLE DEFECTS OF
CHILDHOOD.¹

By E. H. WILKINS, M.B., Dub., *Superintendent of the School Medical Services, N.Z.*

PHYSICAL DEFECTS OF NEW ZEALAND SCHOOL CHILDREN.—To medical men in private practice the poor physical condition of present-day children is not likely to be so obvious as to one engaged in examining large numbers in the schools. The extreme rarity of a complete sound set of teeth and the great prevalence of deformity of the chest are indices of serious errors in their upbringing. The most serious and widespread physical defects found in New Zealand school children are dental caries, faulty development of the jaws and palate, nasal obstruction, adenoids and enlarged tonsils, and rachitic deformity of the chest. I am confident that these defects are due to the same fundamental causes, that these causes can be easily removed, and that, therefore, the vast majority of the diseases and defects from which children suffer are readily preventable. The causes are, I maintain, errors in nutrition, and consist in (1) the unnatural softness of foods, (2) deficiency in vitamins, and (3) deficiency of salts.

MASTICATION, ADENOIDS AND JAW DEVELOPMENT.—Let us consider faulty development of the jaws. It shows itself in crowding and irregularity of the teeth and malocclusion. Insufficient expansion of the upper jaw results in a narrow high arching of the palate, which is of necessity accompanied by narrow, poorly expanded nostrils and deflection of the septum. The consequent tendency to nasal obstruction results in deficient ventilation and a moist, catarrhal state of the nasal passages. The catarrhal condition is increased by the irritation of mouth breathing. Both these factors cause an unnaturally moist and sodden state of the nasal and post-nasal mucous membrane. This is admittedly a cause of chronic enlargement—analogueous to exuberant granulations in a discharging wound—hence the polypoid overgrowth of the pharyngeal tonsil which we call adenoids. Or the adenoid enlargement may be compensatory, to cope with the bacteria which inevitably accompany catarrh. Another theory

¹ Reprinted, by permission, from the *New Zealand Medical Journal*, 1920.

is that the adenoids are primary and are in some way due to disturbance of the internal secretions, and that the adenoids lead to poor expansion of the nostrils, palate, and so on.

It is a clinical fact that removal of adenoids and the establishment of nasal breathing tends to rectify under-development of the jaw; but I am confident of this—that under-development of the jaw, due to deficient masticatory exercise, is the primary condition.

VICIOUS CIRCLES.—Just as poor development of the upper jaw results consecutively in narrow nostrils, nasal obstruction, and adenoids, so also the resulting mouth-breathing, by irritating the respiratory passages, tends to increase the nasal obstruction, and the open mouth, by traction on the cheeks, tends to increase the narrowing of the jaws.

IRREGULARITY, MOUTH-BREATHING AND CARIES.—Again, irregularity of the teeth increases the tendency to the retention of food in the inter-dental crevices, and, therefore, increases the tendency to dental caries. Mouth-breathing, by causing dryness of the gums and teeth and putting into abeyance the cleansing action of the saliva, also increases dental caries. Faulty development of the jaws, being the cause of both dental irregularity and mouth-breathing, is, therefore, in these two ways a cause of dental caries. Also, the septic state resulting from dental caries, undoubtedly contributes to a septic enlargement of the tonsils. Here, then, are many vicious circles reacting upon each other.

DIET AS THE CHIEF CAUSE.—If, therefore, poor jaw development is directly and indirectly the cause or one of the causes of these evils, what is the cause of the poor jaw development? I believe that it is due chiefly to the first of the three dietetic deficiencies mentioned above—the unnatural softness of food. Lack of vigorous mastication, especially in the early growing years of childhood, results in poor development of the muscles of mastication, with consequent poor development of the bones to which they are attached. The pull of the masseter muscles in vigorous mastication undoubtedly has a widening effect on the lower jaw, and the actual biting force of mastication must tend to spread and widen the arch of the maxilla and palate. The pterygoid plate of the ethmoid is in

close relation to the lateral wall of the naso-pharynx and to the palate bones which form the outer walls of the posterior part of the nostrils. The outward pull of the pterygoids, therefore, would seem to have a widening effect upon the naso-pharynx and on the posterior part of the nose, the parts which are so frequently narrowed and obstructed. Therefore, vigorous exercise of the jaws in masticating hard food contributes, in more ways than one, to well-developed jaws, a wide arch of the palate, and wide and roomy nostrils and naso-pharynx.

We are all familiar with the close association of narrow jaws, crowding of teeth, narrow, highly arched palate, nasal obstruction and adenoids, but there is no general recognition of the lack of mastication and under-development of the jaws as the primary cause. We can bring a few additional arguments to bear on the problem.

SOFTNESS OF CHILDREN'S FOOD.—The softness of modern food, especially of children's food, is one of the most obvious departures from the natural in modern diet. It operates from about twelve months of age and continues throughout the whole period of growth. Surely the lack of this most natural exercise, for which every young child shows such an obvious craving, during a period most sensitive to habit and environment, is likely to have some marked developmental effect upon the structures concerned.

EFFECT OF BOTTLE-FEEDING.—The undue sucking in bottle-feeding as contrasted with the munching of breast-feeding has also been shown to lead to a narrowing of the jaws. Dummies and thumb-sucking to a much greater extent have the same effect, as well as being media for bacterial infection.

UNDEVELOPED JAWS, THE PRIMARY ERROR.—When we consider the massiveness of the muscles of mastication in comparison to the size of the bones to which they are attached it is natural to expect that their vigorous exercise would have an important effect upon the circulation to, and development of, the jaws. Again, the greatest under-development is not in the upper but in the lower jaw, where one would expect it to be, as it is to it that the masticatory muscles are attached, the upper being stationary and passive. Owing to the

peculiar interlocking of the teeth, I believe that dentists find the lower jaw is the primary one in which to correct deformity, as to a great extent it controls the shape of the upper.

Further, the actual size of the palate and the actual size of the nasal septum do not appear to be affected. Both these structures retain their natural dimensions, but through lack of space are compelled to undergo unnatural curvature. The primary developmental error seems to be, not in the nose and not in the palate, but in the jaws. The jaws are undersized; no part of the nasal structure is undersized, it is simply unexpanded. Surely this proves indisputably that the jaw condition is primary, and if this is not due to lack of hard food—lack of exercise of the jaw—what is it due to? There is a serious developmental flaw in the modern child's jaw which fails to bring the individual teeth of the second set into their proper positions.

Now, I am not claiming to have discovered anything. Attention has been called to these matters by others whose opinions are worth more than mine—by Dr. Pickerill, Sim Wallace, Harry Campbell, and many others. I am merely reviewing the facts with a view to obtaining for them greater general recognition as the causes of these very far-reaching and widespread defects. If insufficient exercise of the jaws is causing these serious defects in children, surely the medical and dental professions should be in a position to recommend the remedy.

FAR-REACHING CONSEQUENCES.—I might draw attention here to the close association between deformity of the jaw and adenoids on the one hand and pigeon-breast and depression of the ribs on the other. While softness of bone makes these deformities possible, the resistance to inspiration caused by adenoids certainly contributes to depression of the chest-wall. And, conversely, the diminished respiratory power resulting from poor development of the chest renders the overcoming of nasal obstruction more difficult.

CARIES—A PREDISPOSING CAUSE.—Passing on to the subject of dental caries, although there may be some doubt as to its immediate cause, I think there can be no doubt that a great predisposing cause is the poor quality and defective structure

of the teeth themselves, so that they are unable to withstand the strain of modern oral conditions. Defective structure of the teeth has been shown by experiments on animals to result from diets deficient in vitamins, and, as teeth, are composed chiefly of lime, the metabolism of mineral salts is a factor of great importance. In referring to mineral salts I mean their organic combinations in food, not inorganic mineral. The latter is comparatively unimportant and can in no way replace the former.

DEFICIENCIES OF COMMON FOODS.—Most of our common foods are deficient in vitamins and mineral salts. Meat contains practically no lime: ninety-nine per cent. of the lime in an animal is contained in the bones; and carnivorous animals, who depend altogether on animal food, eat the bones as well as the flesh. Wheat, whole rice, maize, and barley are valuable sources of vitamins and salts, but in the artificially refined and partial state in which they are now eaten—as white flour, polished rice, cornflour, and pearl barley—they are deprived of their germ and outer layers, and so lose all the vitamins and about fifty per cent. of their salts. In the common method of boiling vegetables an average of forty per cent. of their potash and other salts is thrown down the sink. By carelessness in allowing vegetables to cook for an unduly long time, their vitamins are to a great extent destroyed. Sago, tapioca, and arrowroot consist of chemically or mechanically separated starch, and are deficient in vitamins and salts. The vitamins of the fruit in jam are completely devitalised by the prolonged cooking to which they are subjected. The same applies to sugar, which is chemically pure, and therefore a highly deficient and unbalanced food. All the common foods have been mentioned except oatmeal, milk and its products, fruit and honey, all of which are valuable for their vitamins and salts.

It is obvious, therefore, that the bulk of our diet is very deficient in these important constituents. Enough has been said by those who have done original work regarding the effects of deficiency of vitamins to indicate that their artificial removal is a dangerous procedure, and that it is impossible at present to estimate how much ill-health and lowered vitality are directly due to it

LACK OF LIME SALTS.—With regard to mineral nutriment, Bunge says that lime and iron salts are those which are likely to be insufficient in ordinary diets. Sherman, of Columbia University, says that the usual diet is frequently deficient in lime. These deficiencies are calculated in terms of the adult requirements of calcium, but the growing child, whose bones and teeth are in process of calcification, requires more calcium in proportion to its weight than the adult. Hence to the child this deficiency is more serious.

The deficiency of lime would be serious enough in itself, but is rendered more so by the concurrent deficiency of other alkaline salts, as will be shown.

GRAVE RESULTS OF FAULTY FEEDING AND COOKERY.—As a result of metabolism, acid substances are produced which have to be neutralised in the body. They are neutralised by the alkaline bases derived from food. Hence the great value of the alkaline salts of potassium and sodium, and of the vegetable and fruit acids, which are oxidised into alkaline carbonates.

Meat is relatively poor in basic salts. Meat contains sulphur and phosphorus compounds which by oxidation in the body form sulphuric and phosphoric acids. According to Sherman, meat and eggs yield a considerable excess of acids. A diet in which the acid-forming elements greatly predominate must result in a withdrawal of fixed alkalies from the blood and tissues.

Now, in cooking vegetables we throw away forty per cent. of these vegetable alkalies; and in New Zealand we eat an absurd excess of meat. What seems to be a matter of immense importance is this—that, under these circumstances, calcium, which is on its way to the building of bones and teeth, may be diverted into the neutralising of these acids, and in this way the calcification of bones and of dental enamel may be interfered with.

Not only is it possible by the depletion of the alkaline reserves of the body to divert calcium from bone construction, but, according to Voit, bone takes some part in the daily metabolism, and it is possible, on a diet deficient in mineral, for the lime in the bones to be withdrawn to neutralise the acids of metabolism. Bunge says that calcium more than any other inorganic element is likely to be deficient as a result

of the change from mother's milk to other food. It has been shown that the majority of American diets, even for the adult, are dangerously deficient in lime and also in phosphorus—and what applies to American applies also to New Zealand diets, for they are practically the same.

VALUE OF FRUIT AND VEGETABLES.—It is now definitely established that in anæmia medicinal inorganic iron is not itself built into hæmoglobin, but acts only as a stimulant to blood formation from the organic iron compounds of food. The iron content of food, which according to Abderhalden is also dangerously low in the average diet, is therefore, a matter of great importance. Everything points to the necessity of giving serious consideration to the mineral content of our diet, especially as degeneration in the structure and rapid decay of the teeth—one of the chief mineral-built organs in the body—has become such a veritable menace to national health.

I will quote a passage from Von Noorden, one of the strongest advocates of a liberal use of meat in the adult diet. He says : " The necessity of a generous supply of vegetables and fruits must be particularly emphasised. They are of the greatest importance for the normal development of the body and of all its functions. As far as children are concerned, we believe we could do better by following the diet of the most rigid vegetarians than by feeding the children as though they were carnivora, according to the bad custom which is still prevalent. If we limit the most important sources of iron—vegetables and fruit—we cause a certain sluggishness of blood formations and an entire lack of reserve iron such as is normally found in the liver, spleen, and bone marrow of healthy, well-nourished individuals."

In Sherman's *Chemistry of Food and Nutrition* we find : " In an experimental dietary study in New York it was found that the free use of vegetables, whole wheat bread, and the cheaper sorts of fruit, with milk, but without meat, resulted in a gain of thirty per cent. in the iron content of the diet, while the protein fuel value and cost remained the same as in the ordinary mixed diet." I make these quotations to emphasise the importance of the salts of vegetable foods as constituents of our diet.

DIET AND THE SALIVA.—The consideration of the causes of dental caries is not complete without reference to the effects of modern diet upon the flow of saliva and upon acid fermentation in the mouth. This subject has been fully dealt with by Dr. Pickerill, and I believe it to be of very great importance. I will confine myself to the observation that the same artificialities in diet which contribute to poorly built teeth also have a depressing effect upon the flow of saliva. The lack of hard food, the undue moisture and pastiness of food, the lack of fibre, of raw vegetable juices and raw fruit, the excessive consumption of sugar and tea and sweet confectionery—all these factors depress the flow of saliva and contribute to the retention of food about the teeth. The high milling of cereals, the removal of so much mineral matter and flavour from vegetables by cooking and the use of so many artificially separated and soft foods not only produce badly formed teeth and jaws, but also increase the virulence of the conditions they have to contend with in the mouth.

FOOD THE BASIS OF HEALTH.—There may be some difference of opinion as to the exact *modus operandi* of how these defects of childhood are brought about, and I do not wish to insist too much on any particular theory. My main contention is that it is the artificial nature of the foods we eat—something in the food or something which is not in it—that is responsible for these evidences of malnutrition. No one, I think, will disagree on this point—the fate of the Maoris' teeth in the course of about two generations is a clear proof of it.

I think you will agree with me, however, that we have very definite scientific reasons for urging the most radical dietetic reform. We know that the mineral and vitamine contents of foods are reduced by artificial processes. We know—if we know anything—that these deficiencies cause poor nutrition and poor development of bones and teeth; and at the same time these very defects are assuming gigantic proportions and threatening to undermine our national welfare. If the British Empire is to withstand successfully the storms of the future, it must possess that indispensable foundation of national greatness, the health of the people. Food, of all matters, is the basis of health. We must have hard food,

that we may learn the salutary virtue of mastication ; we must have whole cereals—wheatmeal bread and unpolished rice ; we must eat less meat ; learn the value of fruits and vegetables, and above all, learn how to cook them ; we must appreciate the value of uncooked foods—we must look after the salts and the vitamins. I do not know of any matter of more urgent and vital importance to the health of the country than this one of food.

A FINAL APPEAL.—I have called your attention to matters which have been written about by others, but which, from my experience in the medical inspection of school children, I am very strongly of opinion deserve more serious consideration than they have up to the present received. As Superintendent of the School Medical Services I am concerned with the health of the rising generation. The medical inspectors of schools are apostles of health, endeavouring to educate the public in how to rear healthy, robust and vigorous children. At the recent conference of our staff in Wellington a committee was formed to decide upon a uniform code of recommendations regarding children's health, most of which are embodied in what I have already said. If any of our fraternity in private practice have other theories as to the causes of these defects, or can in any way assist us, we shall be very much indebted to them. It is our aim to lay the foundations of a healthier, a happier, and a more prosperous New Zealand. We want your help and co-operation in this great work.

MALDEVELOPMENT OF JAWS—A MODIFICATION.—P.S.—As a result of talking over some of these matters at the Medical Conference, I have modified my views slightly regarding the causes of maldevelopment of the jaws. While I still maintain that vigorous mastication has a very important effect upon the size and general growth of the jaws, I believe now that the actual shape of the jaw is controlled more by the moulding action of the lips and tongue. The muscles of mastication are attached to the posterior part of the jaws, whereas it is the anterior part of the alveolar arch which is so commonly narrowed and misshaped. I am inclined to think that the first factor in the vicious series is bottle-feeding and the dummy. These tend to push up the centre of the palate and to narrow the jaws by the constant sucking, thus producing

the tendency to nasal obstruction. The resulting open mouth brings further narrowing pressure on the jaws, and the open relaxed lips allow the incisor teeth to be pressed forward. These forces, though slight, are acting constantly, and—like the ivy spray which pushes its way through a stone wall—would have a considerable effect upon the soft developing jawbone. Decay and early extraction of the temporary teeth are other important causes of undersized jaws.

A ROBBER OF INDUSTRY.¹

THE PRICE AND PENALTY OF BAD TEETH.

[By a singular coincidence, this weighty article, from the Medical Correspondent of *The Times*, appeared in its Trade Supplement on May 1, 1920. In a brief letter in support, attention was called to the Conference which was about to assemble and a cordial invitation extended to the heads of firms to send representatives. It is to be regretted that the response was so meagre, the more so in view of the valuable contributions to the discussions made by the representatives of two great Midland and Northern firms.—Ed.]

Several great employers of labour have just added dental care to the medical inspection being carried on in their factories. At first sight this may appear to be a refinement which is unlikely to justify itself, at any rate on the purely business side. But that view is certainly an erroneous one. The truth would rather seem to be that bad teeth, like other forms of chronic disease, must be added to that "robber band" which, in season and out, takes from industry its legitimate fruits.

EXTENT OF THE EVIL.—The evil at any rate is vastly more widespread than is generally imagined. Its common occurrence blinds men and women to its importance. Because young people feel fairly well in spite of a mouthful of bad teeth, they tend to imagine that this disease is of no account. When, at later ages, gastric and rheumatic troubles limit their efficiency and so deprive them of the rewards to which their experience and work should have entitled them, they fail to trace a connection between cause and effect. A few at this time have their bad teeth extracted; but often

¹ Reprinted, by permission, from *The Times Trade Supplement*, May 1, 1920.

this remedy comes too late. Serious organic mischief has been begun, and the best that can be hoped for is an arrest rather than a cure of the process of disease.

CRIPPLED YOUTH.—Long before this stage is reached, however, youth itself has, in very many instances, been crippled by the carious teeth. All modern research work has gone to show that a man's efficiency in any task depends primarily on the balance of his nervous system. This system is made up of several different elements, which work together in what may be termed a reciprocal manner. So long as each element maintains its normal excitability and responds normally to the stimuli reaching it from the outside world, so long deft and efficient work will be performed.

But as soon as this normal balance is upset a different state of matters will declare itself. So that the presence of any poison in the system which has an action on the nervous mechanism at once throws this mechanism out of gear. If the subject is young and resilient, a new balance can usually be struck. But this new balance is always more costly to the organism than the old, normal one. The man or woman really works at higher pressure, spends more energy on any given operation than was formerly spent, becomes more easily tired and is capable of doing good work for shorter periods than before.

This, of course, represents loss. The point about the bad teeth is that they afford, in and around their sockets, a nidus for the growth of disease germs. The healthy tooth is protected; the carious tooth has lost its protection. Abscesses tend to form about its roots, or, in other cases, slow types of inflammation are set up.

The process of chewing intensifies this mischief, for the bad, broken down teeth cannot be kept properly clean, even with the best will—and many workers make no attempt at cleanliness. Thus poison is freely produced. A certain amount of this poison is absorbed directly from the gum socket into the blood. Other portions of it are mixed with the food and swallowed, giving rise to trouble all along the alimentary tract.

THE POISONED SYSTEM.—Thus the nervous system is poisoned at an early date, long before general health has been lost. The man or woman is already started on that long road which

leads at last to physical bankruptcy. Every physician has seen such cases, and most are prepared to testify to the immense improvement in general health and working fitness which follows a visit to a competent dentist.

The subject is at this moment engaging the attention of the health authorities, who learned a bitter lesson during the war, when enormous numbers of men presented themselves with mouths, as one examiner put it, "reeking with disease and infection." The trouble often begins in childhood and gets worse as time goes on. Recent reports show that at least 50 per cent. of school children require dental treatment. The Departmental Committee on Sickness Benefit Claims under the National Insurance Act pointed out the prevalence of dental mischief among insured persons (*e.g.*, the workers of the country) and declared that this produces "much sickness of various kinds resulting in a drain on the sickness benefit funds."

COST TO INDUSTRY.—The Prudential Approved Societies have, according to Sir George Newman, Chief Medical Officer to the Ministry of Health, declared that "neglect of teeth trouble is the cause of quite half of the ill-health found among the industrial classes." The Army Medical Council reported, too, on the loss of man power to the State owing to the same cause. In the Scottish Command it was estimated that "44 per cent. of the men are dentally unfit, *i.e.*, they lack the minimum of dental efficiency which will ensure effective mastication of food." In the Western Command from April, 1917, to March, 1918, between 80 and 90 per cent. of the recruits were in need of dental treatment. (Recruits aged 18–19, 83 per cent., recruits aged 19–44, 33 per cent.) In the Northern Command 84 per cent. of recruits aged 19–24 were suffering from decayed teeth. In the general population it was found that the women had even worse teeth than the men.

DANGER TO THE PUBLIC.—These facts are too well attested to admit of doubt. They mean that the need of dentistry among the industrial population is paramount, since the lack of it is one of the great factors in defeating the ends of national economy. Nor should it be forgotten that the dirty mouth is a potent spreader of infection. The worker whose teeth

require attention becomes a danger to his fellows. In all occupations concerned with the handling of food he is a danger to the public.

A PREVENTABLE LOSS.—Every employer is concerned in this business. Every employer should realise that dental trouble of all sorts is preventable. As Sir George Newman has declared: "Cleanliness, a detergent diet and early conservative dentistry would solve the problem." The work should begin at school (the relationship between a good school medical service and industrial efficiency is, as we have insisted, a close one). It should be continued throughout industrial life. Its basis must be inspection at regular intervals followed by treatment. No portion of the body more forcibly illustrates the adage "a stitch in time saves nine" than the teeth.

It is understood that the State means to move in this matter at no distant date. But the wise employer will not wait for Government action. He will examine the question for himself and attempt to discover whether the work of obtaining dental help is likely to prove remunerative or not. We do not think that he can conclude otherwise than we have indicated. Let him not, however, disguise from himself that the task of taking this problem in hand is likely to prove a difficult one.

The public have a rooted objection to going to dentists. This objection will not become less when a dentist is introduced under the auspices of an employer. There are sections of the working community which will welcome a doctor and fiercely resent a dentist. These people will argue that the state of their teeth is their own affair and that no one has any right to dictate to them.

NEED FOR PROPAGANDA.—It will be quite idle to attempt to enforce this reform. On the other hand, education cannot fail to achieve results. The reason why the average worker pays no attention to his or her teeth is to be traced to ignorance. The worker simply does not understand what is involved. Dentistry is looked on as a fad of the well-to-do.

The moment this view is replaced by knowledge opposition will disappear. Every worker is afraid of ill-health. If medical men of standing were to come to the men and women

and tell them plainly what the septic mouth means, what it costs in diminished working power, and still more perhaps in diminished capacity for pleasure, and what, finally, it is likely to produce, there would be a demand for treatment which would be insistent.

Propaganda, therefore, is essential if the evil of dental decay is to be removed. This propaganda should be undertaken, by rights, by the factory doctor and nurse. It would result soon in the creation of a public spirit which would regard any dirty mouth as a danger and demand its removal or cleansing. Thus the careful and clean worker would exercise discipline over the careless and unclean to the great advantage of all concerned.

The next step would be the employment of a dentist. This need not be an expensive matter, for if entrants were examined and some of them rejected on dental grounds the general level of tooth-cleanliness would be high. Inspection would then be a simple matter, involving no more than occasional visits. All teeth found to be diseased could be dealt with after the inspection at the employers' expense. Thus the whole staff would be kept free of dental disease—and so of the vast number of small complaints which depend on dental disease and which, in the aggregate, rob industry of so many hours of labour.

DEARTH OF QUALIFIED DENTISTS.—Unhappily at the moment the country is suffering from a lack of qualified dentists. So careless have people become in regard to their teeth that great masses of the population never visit a dentist unless they are suffering from severe toothache. At these times they exercise no discrimination between qualified and unqualified, between the man of science and the mere unskilled practitioner. Thus a great army of so-called "unregistered dentists" has come into being, while fully trained workers have dwindled in numbers.

It has been suggested that the Government must step in and amend the Dentists Act of 1878 so as to encourage proper training. Employers would consult their own interests by supporting this movement. The registered dentist serves as an apostle of progress and by his skilled work saves his patients from dental disease. He thus helps to

produce that health conscience on which, in the last instance, industry relies for its human machinery. Moreover, he inspires in his patients the desire to keep their teeth and so saves them from the stomach and nerve troubles which follow imperfect mastication.

It is not perhaps possible at present that every factory or workshop should have its own dentist. But it is certainly possible that groups of factories and shops should be under the dental care of a qualified man who would, so far as his other duties allowed, exercise a general supervision. Industry as a whole would become more productive; the nation could not fail to gain a greatly increased measure of general health.

THE EVILS OF SWEET EATING.¹

[Mrs. Garrett is a social worker in rural East Anglia, who combines exceptional powers of observation with the enthusiasm and zeal of a reformer and the pen of a ready writer. Her letters during the past decade have provided many readers with a mental diet, alike stimulating, suggestive and helpful. As the daughter of a famous Manchester physician of a former generation, there is a special appropriateness in her letter figuring in this volume. Other extracts will be found in "Educational Methods among Children and Adults," pages 317-318.—Ed.]

THE TEACHING OF COOKERY.—At the last annual meeting of the Women's Imperial Health Association I ventured to suggest that perhaps the Association might bring to the notice of the Education Authorities the desirability of the teachers of cookery in elementary schools not only teaching the children cooking, but something of how and when food should be eaten. A splendid opportunity is lost here. The cooking lessons as far as they go are often excellent, but when I have sometimes suggested to the teachers that they should speak to the children about the evils of incessant sweet-eating or of eating too often, etc., etc., I have always been told it does not come in their course.

MALNUTRITION AND CARIES—A COMMON CAUSE.—The prevalent evils of malnutrition and dental caries are exercising us all. It is striking as well as encouraging that investigations

¹ A letter reprinted, by permission, from *National Health*, July, 1913.

point more and more to the fact that these evils are due far more to wrong feeding than to poverty, hitherto thought to be the chief cause.

This is frequently mentioned in Sir George Newman's last report to the Board of Education, and various authorities are quoted to support this view. Dr. Stewart, Medical Officer of the East Suffolk County Council, also says: "Nutrition itself is one of the interesting problems of medical inspection, for the poorest half-clad child may, and often does, show a higher grade of nutrition than the heavily clothed, carefully tended child of comparatively well-to-do parents," and again, "Dental caries increases in direct ratio with the wealth of the parents; the poorest as a rule have the best teeth."¹

FRANCE, A CONTRAST.—Anyone who has travelled much in France must be struck by the alert, well-nourished appearance of the children in most localities. This is in part due to their less stodgy diet and to the fact that French women know much more about the preparation of food and take infinitely more trouble about it. The English working classes spend much more on their food^a and have more meals, but the food is heavy and there is little variety. The better-to-do used tinned food as their staple article of diet.

SWEETS AND DECAY.—There are some striking statistics in the report of the Board of Education on the eating of sweets between meals as a cause of dental caries. In France again I have been struck by the excellent teeth and also by the absence of sweet shops. Anyone who has much knowledge of the children in elementary schools knows what vast sums are wasted in buying sweets. A district nurse told me that in a village of 1,000 inhabitants the woman at the shop told her she sold 1 cwt. of sweets a month.

THE MIDDAY MEAL.—I have made it my business sometimes to see what sort of food the children bring who stay at school for their midday meal. Out of 20 children only one had brown bread and cheese and lettuce, and that was on my

¹ Whilst only 0·2 per cent. of the school children in Hampstead required treatment for malnutrition, no less than 31·8 per cent. required treatment for defective teeth, compared with 25·6 for all London.—Dr. F. E. Scrase, M.O.H., Hampstead, 1920.—Ed.

^a Cf. Board of Trade Report, 1909, Cd. 4512.—Ed.

suggestion, the child being from Dr. Barnardo's Homes ; the rest had sausage rolls, pastry and jam, fine white bread and jam and cake.¹ Many of these were from quite well-to-do homes.

JEW AND GENTILE.—A dentist told me he had lately had an interesting experience in examining the teeth of the children in two schools, one an industrial school and one a Jewish school. He had always known the Jewish children to have better teeth than the Gentiles, but he found in these two schools there was no difference ; the children in each had 25 per cent. of absolutely perfect teeth. Those in the industrial school had very simple, rather poor food, and no sweets.

THE PART OF THE TEACHER.—Surely the teachers, and especially teachers of cookery, might help in these matters, and try to instil into the children habits of real temperance and self-control, on which their physical, mental and moral well-being so much depends.

Mrs. L. M. GARRETT.

Snape, Saxmundham.

TRAVELLING COMPANIONS.

I.—CARE OF THE TEETH.²

AN INDIAN EXAMPLE.—"It is an ill wind that blows nobody any good," and the writer was reduced, not for the first time during recent years, to sitting on his baggage in the corridor of an express bound for the North. Under these conditions one's fellow-travellers are often found to be more communicative than in the recesses of a compartment. One such had served many years in the Indian Army. Through his familiarity with several of the languages he had been able to mix with the natives to a greater extent than the average soldier, especially as during part of the time he was doing civilian work in the Army. Remarking his generally fit appearance and wonderfully perfect set of teeth, the writer

¹ Out of 815 children examined, 785 had more or less decayed teeth. Faulty feeding in infancy and childhood, excess of starch and sugar in the form of white bread, tea-cakes, chipped potatoes and sweets was largely responsible.—Dr. J. Lawson Russell, Annual Report, on the Todmorden Schools, 1909.—Ed.

² Reprinted, by permission, from *National Health*, August, 1919.

ventured to inquire if he were fond of hard foods or of fruit. The reply was in the affirmative, and information was volunteered as to how he had come to take special care of his teeth. When in India he had observed that the natives employed sticks as cleansers. One old English soldier possessed an exceptionally fine array of teeth, which he attributed to the fact that he had acted on the principle—"When you are in Rome, do as the Romans do." During the rest of his stay, the former used the sticks regularly morning and evening, and also, like the Indians, rinsed his mouth thoroughly.

A SCHOOLMASTER'S LESSON.—He had been home for four years, during which period his teeth have kept in good condition, though he now relies on the toothbrush. That this is so is apparently mainly due to his habit of chewing his food. This practice he learnt at school, where his master, an enthusiastic Gladstonian, had seized the opportunity of the great statesman's death to give the boys a lesson on his habit of allowing thirty-two bites to every mouthful. This so impressed the lad that he made it a rule henceforth. Nowadays he also takes salad freely. This is the more important, as his diet, for the most part, consists of ordinary soft English food, the ill-effects of which are thus, to some extent, counteracted. Moreover, he drinks little at meals, and then only water.

A DUMB PROTEST.—Another recent railway experience may be coupled with the above. On that occasion a tiny baby boy, aged ten months, and looking very "podgy," was given by his mother, at short intervals, soft biscuits which he was obviously quite incapable of digesting. She even forced him to eat them, although he displayed conscientious or other objections. Finally, he dropped one on the floor, possibly by way of dumb protest. Even this, and a warning, did not save him, and he was condemned to swallow yet another coated with filth, while his parents enjoyed some fresh from the bag. At length outraged Dame Nature would not be denied, and baby slept, and so was safe for the time being. This comedy, or rather tragedy, was enacted in the space of a short period. It is but fair to add that both parents were very young.

2. THE MANCHESTER CONFERENCE—AND AFTER.¹

THE Manchester Conference on the Prevention of Diseases of the Teeth was a remarkable success, looked at from every point of view. The papers maintained a high level of interest, the discussions never flagged, the attendance was representative and satisfactory, having regard to the high pressure at which so many are working and the obstacles to travel, and last, though not least, the Press bestowed much attention on the proceedings, which were thus brought to the notice of millions of readers. Copies of the abstracts of papers may be obtained, price 3d., or 2s. 6d. the set of eleven.

The Conference should be regarded merely as a landmark in the movement begun some years ago. The next stage will be the publication of the report, followed, it is hoped, by local campaigns throughout the country.

A TYPICAL EXPERIENCE.—If it is permissible to argue from the practice of one's fellow-travellers a week later, action is not being taken before it is needed. Shortly after starting, about noon, a small girl of eight was given a sponge-cake by her fond mother, and on the writer mildly remonstrating, he was informed that the little maiden was particularly fond of sponge-cakes. The mischief in this case was, to some extent, atoned for by the consumption after a short interval of an orange. The child had good jaws and teeth, and was healthy looking, though but a year ago she had lost a leg in a tramcar accident. Her brother went to a small, but seemingly remarkably enlightened school, where pupils are discouraged from drinking at meals and taught to sniff water up their nostrils every morning. The latter practice, besides helping to keep the children fit, is found to save handkerchiefs. All the cooking is done by the wife of the head master. Another occupant of the compartment, an unhealthy-looking French or Swiss woman, soon afterwards started her midday repast, which consisted of a huge turnover, about a foot long, filled with gooseberries. It also offended against the canons laid down at the Manchester Conference as consisting almost entirely of starch; and giving the teeth or jaws little or no work. Fortunately her appetite proved unequal to the task of disposing of more than half!

¹ Reprinted, by permission, from *National Health*, July, 1920.

(B) *THE WAY OUT*PREVENTION OF DISEASE.¹

BY A PHYSICIAN.

CONCENTRATE ON THE TEETH.—The Ministry of Health must teach the public by constant propaganda how to keep well. Prevention must begin with the expectant mother. She must be under medical and general supervision. The country must see to it that every baby possible is breast fed. The children must be watched continuously and their parents instructed. There is one disease above all others on which the public are urged to concentrate their attention, and that is decay of the teeth. It affects almost every member of the community. It begins in childhood. It lowers the health of the child, and consequently it predisposes it to tubercle and disease generally. It is impossible to exaggerate the suffering and economic loss caused to the community by this apparently trivial, but really terrible, disease. It is estimated that at least 20 per cent. of all chronic disease in this country is due, directly or indirectly, to the state of the teeth. The cost to the country through the consequent inefficiency of its citizens amounts to an enormous sum every year.

COWS *VERSUS* HUMANS.—The disease affects especially the British Empire and the U.S.A. For instance, *The Times* correspondent at Wellington, N.Z., sends the following message, July 16th, 1918: "The President of the Dental Association was the spokesman of a deputation which urged the Government to establish dental bursaries. He said that the examination of thousands of school children in New Zealand showed the percentage of those suffering from dental caries to be 95. *If cows were similarly affected they would not be tolerated for one month.*" (Italics mine.) The sting lies, as usual, in the tail. If the cows could neither crop the grass nor chew the cud it would spell ruin; and no one would rest until *the cause* was discovered.

THE FIRST ESSENTIAL TO HEALTH.—It must be obvious to any sane individual that the first essential to health is a

¹ Reprinted, by permission, from *The Statist*, February 15, 1919.

clean wholesome mouth with two rows of sound teeth. Yet this necessary condition is rarely seen in our midst. The tooth, the hardest part of the body, rots while the child is in the nursery and the schoolroom. What is the object of spending huge sums on sanatoria and other schemes while this disease is allowed to exist from childhood ?

DISEASES OF THE MOUTH.—Just consider how many diseases affect some part of the alimentary canal, and it will be at once obvious how necessary it is to begin with the care of the mouth. Diphtheria, tonsillitis, the sore throat of measles and scarlet fever, dyspepsia, ulcer of the stomach, appendicitis, forms of rheumatism and cancer, are examples. One of the best-known surgeons in the world actually removes *several feet* of the large intestine because the food taken into the mouth does not pass satisfactorily through the canal. Many surgeons are performing grave operations because of the ulcers existing in the stomach or the portion of the tube next below it.

RÔLE OF THE DENTIST.—The public should remember that the care of the mouth is *presumed* to be in the hands of the dentist. As a matter of fact his advice is only sought after the disease is already present. The dentist is still regarded by many of the public and of the medical profession as holding an inferior position to the latter. In reality the dentist is a medical specialist, a dental surgeon, and of far greater importance to the community than the throat specialist.

HONOUR WHERE HONOUR IS DUE.—Dr. Sim Wallace, the dental surgeon, has pointed out for many years that dental disease is caused by faulty food and feeding. He claims that he is bringing up children with sound teeth to-day, that it is easy to do so, and that the feeding necessary is *actually cheaper*. The medical profession, for the most part, does not appreciate the fact ; and, therefore, this appeal is made to the thinking public. The writer is convinced that Dr. Sim Wallace is right, and that his work will confer upon the community a greater boon than the work of any other living man.

PLEA FOR GOVERNMENT INQUIRY.—The people themselves cannot possibly decide the matter, and therefore they are

urged to recognise the overwhelming importance of the subject and to demand a Government inquiry into the cause of this widespread disease. Dr. Sim Wallace claims that the chief cause of the disease is the adhesive and easily fermentable nature of the modern diet ; also meals between meals, and especially the bread-and-milk at bed-time. The last named leaves a poultice over the crevices of, and between, the teeth during the night ; nascent lactic acid arises on the tooth through the fermentation of the carbohydrate by means of bacilli ; and the special affinity of this acid for the carbonates of the enamel starts the disease.

CHILDREN'S FOOD—AN INDICTMENT.—Take the principal foods of children in this country—*i.e.*, cow's milk, manufactured sugar and sweets, soft white bread, and finely milled flour in biscuits. Cow's milk belongs to the calf, and milk is the natural food for the toothless young only. In small quantities and well diluted, no doubt, cow's milk is useful in the difficult stage between the weaning of the child and the completion of its first teeth. It, or some other animal's milk, is necessary where the mother cannot nurse her baby. It is not the food for healthy children with teeth. Manufactured sugar, in the enormous quantities consumed in this country in 1913, was a modern article of diet. Never grown here, the consumption of refined sugar per head of population had gone up from 9·91 lb. in 1883 to 52·23 lb. in 1900. This takes no account of the syrup in tinned fruits (Sim Wallace). There is all the difference in the world between the native sucking and chewing the *fibrous* cane and the concentrated article in the sugar-basin. Prior to this invasion of sugar and sweets our children made their own sugar out of the starch in such foods as bread and potatoes. A small dose of strychnine well diluted is an excellent tonic for a convalescent ; a sufficiently large dose and the undertaker is sent for. The soft white bread and fine-flour biscuits are a curse to children. It is most important to note that children for some time now have got on quite well without any white bread or fine-flour biscuits, very little sugar or sweets, and much less milk.

DISEASES OF THE ALIMENTARY CANAL.—If the diet taken by children has the effect of destroying the hardest part of the

body, like rust eats into iron, it is surely permissible to suggest that the same diet may be the cause of much of the disease of the rest of the alimentary canal, and, indeed, of the body generally. Dental disease is rampant in the U.S.A.; the very fact of the number and eminence of their dental surgeons is sufficient proof. But in spite of their patching up the teeth as soon as they are diseased, appendicitis, dyspepsia, and other diseases of the alimentary canal are notoriously rife amongst them. They are simply treating the disease; they are not practising *prevention*.

AN OBJECT LESSON FROM ARABIA.—Let us, *at a cost of less than nothing to the Exchequer*, start a race of children fed on rational grounds, with sound teeth and healthy mouths, and then see what happens to them. It is the writer's firm belief that appendicitis and gastric ulcer will become rarities. The writer of this article, prior to August, 1914, was in charge of a hospital for poor country Arabs. As a whole, the country Arab, as opposed to the town Arab, had very good teeth. His diet was composed of a coarse, hard, wholemeal bread, his staple food, eggs, fish, meat when he could afford it, butter, and a large amount of fresh fruit, and dried in the shape of dates. He took no sugar beyond what was in the fruits. In several years not one case of appendicitis was seen, not one case of gastric ulcer, no tonsils or adenoids, cancer almost unknown, not one case of cancer affecting any part of the alimentary canal.

A MELANCHOLY CONTRAST.—The writer then returned to England, where appendicitis is a scourge, dyspepsia and gastric ulcer rife, tonsils and adenoids the same, where cancer is all too prevalent, in order to look after the *picked* young men of the race. In an examination of the mouths of thousands of soldiers *one* perfectly sound set of teeth was discovered. On the other hand, tooth-plates were quite common in lads of nineteen and upwards, decayed teeth and missing teeth the absolute rule. Thousands were rejected from the Army because of their teeth, or because of disease due to them. The condition of the young women is known to be as bad, if not worse.

REMEDIES.—In conclusion: (1) Reform the diet at once. Give the children three meals a day, and nothing between

meals. Give them coarse wholemeal bread. No sweets at all. Finish each meal with something cleansing, such as dry toast and butter, crust of bread and butter or margarine, celery or fruit. Give children a piece of apple after the last meal to cleanse their mouth for the night. Spoil them with fruit and toys, but never with sweets. Grow more apples in the country. (2) Develop the carriage, cold-storage, and distribution by motor to every cottage in the country of our wonderful fish supply, eating, and paying for far less inferior imported butchers' meat. Meat was almost unknown to the poor of England prior to the recent cold-storage invasion. Each cottager killed his pig, and tasted no beef or mutton. Far too much meat was being consumed here in 1913 by those who could afford it. (3) Destroy at once the rats which consume our food and spread disease, including plague, amongst us. (4) Muzzle all dogs throughout the country for twelve months, and stamp out the rabies which has broken out in Devon and Cornwall before it is too late.

CURE OR PREVENTION ?¹

DENTAL TREATMENT AND NATIONAL HEALTH.—In the report issued by the Departmental Committee on the Dentists Act, attention has been drawn to the necessity of enlightening the public by every possible means as to the need for conservative treatment of diseased teeth. A committee of the British Dental Association has recently considered how this could best be carried out, and has embodied its views in a pamphlet which, we believe, has been circulated amongst education and public authorities. The committee, after due deliberation, are of the opinion that it is impossible, owing to the present condition of the dental profession, to formulate an extensive system of State dental service, and consider that, in the first place, every endeavour should be made to obtain a complete school dental service. For the latter purpose they recommend, as a rule, whole-time officers, and are of the opinion that on the staffs of the Educational Departments of England and Scotland there should be dental officers responsible for the work done in local educational areas. For the treatment of expectant mothers and of children under school age they suggest, if possible, the

¹An Editorial reprinted, by permission, from the *Lancet*, August 23, 1919.

appointment of whole-time dental officers, and the institution, where possible, of central laboratories for the provision of dentures. The requirements of the adult population, they think, might for the present be met by an extension of the system of factory clinics, by affording support to the public dental services established by members of the profession, and by the creation in certain large industrial areas of experimental clinics. The report shows very clearly the difficulties of providing an adequate service for the whole community.

CHILDREN UNDER SCHOOL AGE.—It quite rightly emphasises the desirability of treating children of school age, but we consider that, important as this is, there is a greater need to deal with those under school age, for in the children of the masses irretrievable damage has often been done to the teeth before school age. A feasible plan would, we think, be to co-ordinate the work of the children's welfare committees with that of the school authorities, and make it possible for those under school age to be treated by the school dental officers.

NEGLECT OF PREVENTIVE METHODS.—In reading the report we feel that by no means sufficient consideration has been given to the question of prevention. If we are to obtain an improvement in the condition of the teeth of the nation, it will be by teaching the individual to prevent the condition and not to rely upon a cure. One trouble is the indifference of the majority to the question of dental disease, and this can only be overcome by widespread propaganda on the harm which arises therefrom. The establishment of free public lectures and the issue of a small pamphlet written in popular language would prove of inestimable value. By this means the amount of disease would be considerably lessened and there would be a corresponding diminution in the amount of conservative dentistry required.

THE PROBLEM OF DENTAL DISEASE.¹

[In the following annotation the *Lancet*, to some extent, atones for its apparent failure to comment upon the Man-

¹ Reprinted, by permission, from the *Lancet*, August 21, 1920, and succeeding issues.

chester Conference. No words could more effectively drive home the lessons of the papers and discussions on that occasion. The letter from Dr. Nickolls Dunn supplements that from his pen quoted elsewhere (*see* pp. 57-58), while justice to Dr. Adami demands the inclusion of the remarks on his address.—ED.]

The deplorable state of the nation's teeth is only too well known, and health authorities are busily engaged in promoting schemes for treatment. At the recent meeting of the British Dental Association, at Bournemouth, the chief interest centred around this perplexed problem of the dental needs of the public. Dr. R. A. Lyster, the medical officer for Hampshire, pleaded in eloquent terms for further research into dental disease, and from his remarks as reported it would seem that the fundamental causes of dental disease are unknown and that it is therefore useless to lay down definite rules for prevention. This statement, if it gains currency, will tend to undermine belief in the excellent work that has been done on the ætiology of dental disease and on which the present rules for prevention of dental disease are based. These rules have already stood the test of time and produced valuable results, and have abundantly confirmed the correctness of the views held on causation. Speaking in a general sense, dental caries is due to the altered character of the carbohydrate diet and the enormous consumption of sugars, especially those of the monosaccharide group. In the case of periodontal disease also, it is clear that the lodgment of food in the interdental spaces is a prominent factor. Mr. R. Lindsay, in his public lecture, admitted that the remedy was largely concerned with food, but considered that to ban any common foodstuff was outside the sphere of practical politics in the question of the prevention of dental disease. But surely, if one is convinced of the cause, it is culpable negligence to evade the teaching of prevention simply because the obstacles to a radical change in diet appear too great. The stoutest wall will give way before constant battering, and so with this question of food and dental caries. Dentists may be appointed to schools, to the Army, to the Navy, to maternity centres, but little headway will be made towards the banishment of dental disease unless the simple rules of prevention are inculcated. It is, indeed, a stigma to medicine

that the most prevalent disease of the human race is the most easily preventable. If the Ministry of Health will concentrate on teaching prevention by means of popular lectures, illustrated with lantern-slides, and by booklets written in simple language, in the course of two generations we shall see an end to preventable dental disease, and there will be but little need for an elaborate public dental service.

RESULTING CORRESPONDENCE.

I read with pleasure your annotation under this heading in the *Lancet* of August 21st. In this connection may be mentioned some clinical observations made by me at the Luxor hospital for natives in Upper Egypt prior to 1914. Neither appendicitis nor gastric ulcer appeared among my cases, and cancer was rare. Though syphilis was widespread, yet I found no cases of aneurysm or of locomotor ataxy. As regards cancer, the absence of post-mortem examinations may vitiate my impressions of cancer incidence, but I never saw any kind of growth in a breast nor any cases of mammary abscess. My friend, Dr. G. W. Ellacombe, of Livingstone, Northern Rhodesia, had similar experiences among his native patients.

I suggest that immunity from appendicitis and gastric ulcer depended on the nature of the diet, as a result of which, I claim, the population had good teeth. May the absence of gastro-intestinal cancer be due to this also? I would suggest to the Rockefeller Institute that the study of the diet and diseases of the country Arab as compared with his brother living in Cairo and Alexandria might be of value. Owing to the spread of flour mills and sweet shops the diet is rapidly changing, but it is still possible to study the native eating coarse wholemeal unleavened bread, and no sugar beyond the natural solution which he extracts from the fibrous cane and from other fruits.

A short time ago Professor J. G. Adami was reported to have said that the teeth of the U.S.A. citizen were far better than ours. With the utmost respect, I venture to doubt his statement. It is my belief that the teeth of American citizens are extensively diseased, and the very number and importance of their dental surgeons would seem to support my

statement. Now that the U.S.A. have gone "dry," and in consequence still more "sweet," the dental surgeons and doctors will doubtless be busier than ever. The suggestion that 10,000 more dental surgeons are required in this country is also attributed to Professor Adami. I protest at being asked to pay for this expensive host of officials when the advanced disease which they are to scrape out and plug can be almost entirely prevented by common-sense feeding and discipline in the home. Dr. Sim Wallace and others have actually proved that prevention is simple and inexpensive. Dr. James Wheatley, medical officer of health for Shropshire, also has figures pointing to the improvement of the children's teeth under war circumstances which are arresting and which I trust he will publish.¹ For example, cow's milk is an entirely unnatural food for the human child, and its consumption in large quantities may have disastrous results to the children and sick people whose staple diet it has become. Just as alcohol in the form of wine, beer, or spirits does no harm, but in many cases positive good when taken in moderation,² so it is with commercial sugar and with milk. There is far too much stress laid to-day upon heat calories³ and far too little upon the number and kind of meals necessary to exercise the teeth and keep the mouth clean and healthy. Much money and illness and many operations for gastric ulcer and appendicitis could be saved by putting the true facts about dental caries before the women of the country.

W. E. NICKOLLS DUNN, M.B.Lond.

As a layman who has for many years taken a humble part in the campaign for the education of the public in methods of preventing dental disease, may I be allowed to express my gratitude for your annotation of the 21st ult. The view there urged and supported in your last issue by Dr. Nickolls Dunn has the powerful backing of the recent Manchester

¹ See pp. 192-198.

² This statement is not strictly in accord with such modern teaching as is now generally accepted by the medical profession. See *Alcohol: Its Action on the Human Organism*, 1918.—Ed.

³ See "The Fallacy of the Fuel Units (or Calories) of Foods, Eustace Miles, M.A., *Contemporary Review*, December, 1920. Cf. also Professor Gowland Hopkins's "Huxley Lecture," *Lancet*, January 6th, 1921.—Ed.

Conference on the Prevention of Diseases of the Teeth, where many eminent doctors and dentists, as well as scientists like Mrs. Mellanby, social workers like "The Pudding Lady" and Mr. T. C. Horsfall, and educationists like Mr. J. L. Paton and Miss Caroline Herford, discussed the subject exhaustively for two and a half days.

In justice to Professor Adami it should be stated that he did not say that the teeth of the U.S.A. citizens were superior to ours, but merely inferred from their "variegated golden smiles" that they took greater care of them. He was further in agreement with Dr. Harry Campbell as to the ultimate possibility of dispensing with dentists, though, meanwhile, he wished to provide treatment for children and adults whose dietetic errors unfortunately cannot be retrieved.

The full report of the Conference will be found to bear out these statements. I shall be pleased to send particulars to any of your readers.

CHAS. E. HECHT,

Hon. Secretary, Food Education Society.

A LANCET EDITORIAL.

In the *British Dental Journal*, August 16th, 1920, Dr. James Wheatley, the County Medical Officer of Health for Shropshire, makes a valuable contribution to the subject of dental caries. Dr. W. E. N. Dunn called attention to this article in a letter last week (p. 55). For several years Dr. Wheatley has been giving in his yearly reports, data with regard to the incidence of caries in the area under his supervision. The figures he has now furnished are based on the examination of 37,527 children before the war and 10,593 children since the war. These figures show remarkable improvement in children now at the age-period of five years; before the war only 5 per cent. of the children in this age-group were free from caries, whereas no less than 44.4 per cent. of post-war children show no decay. This great improvement he attributes largely to the restriction and modification of food during the war as it affected especially sugar, bread and milk. Children of five have, of course, grown up into these conditions. In the case of sugar the consumption was lessened and sweets almost disappeared for a period. The bread was modified by the addition of so-called offal to the flour and

by the prohibition of the sale of new bread. This, together with the necessity of eating crusts owing to the shortness of supply in general, led to an increase in the practice of mastication. In a small measure Dr. Wheatley considers the improvement may be due to the campaign he started against dental caries, but the chief point of interest is the confirmation by figures of the belief that the cause of caries lies in the food and not in assumed constitutional conditions. In dental caries, Dr. Wheatley remarks :

“ We are dealing not with a disease which we might alleviate or to some extent prevent, but with a most powerful cause of disease and with a condition which is liable to aggravate every other disease. We have an opportunity of removing a cause of disease such as does not present itself in any other branch of preventive medicine.”

A national scheme for the prevention of dental caries is badly needed, and there is already a sufficient basis of unanimity on essentials for such a scheme to be a success ; but if it is to yield the quickest and best results it requires the whole-hearted co-operation of the medical profession.

CAUSES AND INCIDENCE OF DENTAL CARIES.¹

Dr. J. Sim Wallace begins the introduction to his book on the Prevention of Dental Caries as follows : “ Dental caries is one of the most easily and certainly preventable of diseases.” Is this true ? If so, it is a scandal that the details of its prevention are not known to every father and mother in the civilised world. It is impossible to exaggerate the terrible state of the teeth in this country, the disease and economic loss following the dental caries.

I urge you to demand a Government Commission to inquire into the matter at once. This is what the President of the Dental Association of New Zealand said to the Acting Premier last July : “ The examination of thousands of school children in New Zealand shows the percentage of those suffering from dental caries to be 95. If cows were similarly affected they would not be tolerated for one month.”

¹ Letters reprinted, by permission, from the *Lancet*, December 21, 1918, and January 4, 1919.

It is my firm belief that Dr. Sim Wallace has solved the problem.

May I point out that three articles of food, which taken in large quantities are believed to be most pernicious, have been very scarce as regards the first two, unobtainable as regards the third—*i.e.*, (1) milk; (2) manufactured sugar and sweets; (3) soft white bread and finely milled flour in biscuits. Cow's milk belongs to the calf, and milk is the correct food for the toothless young only. Manufactured sugar, in the enormous quantities consumed before the war, is a modern article of diet; previously we made our own sugar. There is all the difference between the native grinding and chewing the cane for his meal and the concentrated article in the sugar-basin. Wholemeal bread *must* be well chewed; it cannot be bolted like the soft white of pre-war days. How are the children to-day? Apart from influenza, which is prevalent throughout the world, their health is excellent. Mr. H. J. Morris, in a letter to *The Lancet* dated April 2nd, 1918, states: "It is easier and cheaper to feed children on preventive lines than as they are generally treated." The matter cannot rest where it is to-day. Are we to teach the public prevention, which costs nothing, or are we to supply an army of dental surgeons to fill the teeth of the whole community?

In my lectures to the soldiers under my care on "Why Does the Tooth, the Hardest Part of the Body, Rot in the Nursery and the Schoolroom?" I have pointed out that I never saw a case of appendicitis amongst the poor country Arabs under my care in Egypt before the war; that no girl ever came to me with a history of indigestion and subsequent gastric ulcer; that cancer, which so often attacks some part of the alimentary canal, was practically unknown to me; that tonsils and adenoids never came my way, the last possibly because practically all the children were breast-fed.

W. E. NICKOLLS DUNN,
Major, R.A.M.C.

Horton War Hospital,
Epsom,
December 7th, 1918.

For upwards of 20 years I have insisted that the appalling prevalence of dental caries and "adenoids" in this country

is due to remedial dietetic causes. It was, therefore, with great interest that I read Major W. E. Nickolls Dunn's letter in your issue of December 21st. I have again and again referred to the prosaic fact that there are among the inhabitants of this country some 200 million carious teeth, as many alveolar abscesses (*pyorrhœa alveolaris*), and some 30 million root abscesses—for the most part preventable by the simplest possible means. Well may Major Dunn exclaim that it "is impossible to exaggerate the state of the teeth in this country." It constitutes, indeed, a national disgrace. Dr. Sim Wallace has time after time debated this matter with me and we have long felt that the remedy can only come through the medical profession.

Three great problems confront the Ministry of Health: the problems of food, housing, and venereal diseases—all, I believe, capable of solution by the application of common-sense principles. Serious as are the two latter problems, I place the food problem first, convinced as I am that it is the most urgent, and that more preventable disease is due to faulty eating and drinking than to any other cause.

HARRY CAMPBELL.

Cavendish Square, W.
December 22nd, 1918.

Like your correspondent, Major Nickolls Dunn, I have come to the conclusion that Dr. Sim Wallace's main contentions are demonstrably true and that the three articles mentioned by Major Dunn are the main offenders in the production of dental caries. With the relaxation of the stringency of food that will come about within the next few months, old habits of diet will be returned to, therefore now is the time to act.

The Association of which I am acting chairman is attempting, by means of lectures and publications, to bring the facts before the public, but until the medical profession and the Government act, little progress can be made against the habits of a generation. The age at which solid food should be given, its character, when flesh food should be added and when it should be given in pieces for mastication are instances in which medical practice differs widely. Can it be doubted that the formation of the jaws and the position

and caries-resisting powers of the teeth are affected by such matters? There are many reasons, too, for believing that adenoids and enlarged tonsils are due to food factors.

H. BECKETT-OVERY, M.D., F.R.C.S.,

Acting Chairman, National Food Reform Association.

December 31st, 1918.

THE THREE CHIEF OFFENDERS

I.—SUGAR AND SWEETS.

AN AMERICAN MEDICAL PRONOUNCEMENT.

[This declaration from across the Atlantic, issued in war time and before the coming of Prohibition (which is said to have led to a great increase in the consumption of candies and sweets generally), will carry considerable weight on this side, where it powerfully reinforces views long and stoutly maintained in enlightened medical and dental quarters.—Ed.]

AN UNFOUNDED APPREHENSION.—The present shortage in the sugar supply in America has caused serious apprehension in the minds of some persons concerning the possible harmful effects upon the health of the people at large and of certain classes of people in particular, that is, young children and nursing mothers. This apprehension is not warranted, and the effect of it is unduly disquieting to the ill-informed.

THE COMMONEST DIETETIC INDISCRETION OF CHILDHOOD.—

The facts are these. In childhood, beyond the period when milk is the principal article of diet, there is probably no dietary indiscretion which leads more often to stomach and intestinal upsets, and these form the bulk of the illnesses of this period of life—through the unbalancing of the diet—than the taking of too much sugars and starches. Therefore a lessening of the amount now habitually used would doubtless be a benefit rather than a detriment.

In infancy the amounts required to meet the needs of the underfed and the marasmic are so small that they could easily be provided for under any condition of shortage that can occur.

Do ADULTS REQUIRE SUGAR?—So far as the adult population is concerned sugar is not an essential. Nature has provided in sufficient amounts for all the sugar that is required, and in forms readily available. In the course of the digestion of starch, sugar is one of the products formed within the body, so that the physiological necessities of the body, so far as sugar is concerned, are met by and within the body in the course of the ordinary process of digestion.

PORRIDGE—A SUGGESTION.—It has been reported that children in families where porridge is used to a great extent as a food will forsake their porridge unless they have it seasoned with sugar and that, inasmuch as this is a conspicuous part of the diet of infants and young children, they are likely to eat less than is required. These children, of course, cannot always be reasoned with. In such cases it is suggested that currants or raisins¹ might be boiled in with the porridge and thus provide the desired sweetness.

E. H. BRADFORD, M.D.,

Dean of Harvard Medical School.

J. J. SUTHERLAND, M.D.,

Dean of Boston University Medical School.

CHARLES F. PAINTER, M.D.,

Dean of Tufts College Medical School.

December 11th, 1917.

SUGAR AND CHILDREN'S DIET.*

Mr. Charles E. Hecht, hon. secretary, National Food Reform Association, writes from Danes Inn House, 265, Strand, London, W.C.2 : " In your ' Miscellany ' of April 3rd, mention is made of the recent statement issued by the heads of the three leading medical schools of Massachusetts, controverting the popular belief that sugar is an essential element in children's diet. In justice, however, to medical and dental opinion on this side of the Atlantic, it ought to be stated that the same views have for many years been urged, notably by Drs. Harry Campbell and Sim Wallace, upon an unwilling, because a prejudiced, public. Those

¹ Or dates, Cf. *Troilus and Cressida*. Act 1, 2. " And then to be baked with no date in the pie."—Ed.

* Reprinted, by permission, from the *Manchester Guardian*, April 5th, 1918.

desiring full information on the subject will find it in *Facts for Patriots*, second series, published originally in 1915, with the approval of Dr. Robert Hutchison, the late Sir Lauder Brunton, Dr. Chalmers Watson, Professor Sir G. Sims Woodhead, and others, and in *Sugar : Why Worry About It?* Ignorance of the matter involves, as the authorities cited by you and the publications above referred to indicate, not merely waste of national resources at a critical juncture, but injury to the health of both children and adults."

"M. C. A." writes from London: "I notice that Mr. Hecht, in his campaign against sugar, relies upon Sir Lauder Brunton, but the last letter published by this high medical authority upsets Mr. Hecht's contentions altogether. Shortly before his death he wrote in *The Times*: 'Mrs. Bramwell Booth very truly says that sweets are a valuable food, especially for children. The nutritive value of sugar is so great that the Germans, some years ago, added it to their soldiers' rations. In addition to this, sugar renders palatable food which might otherwise be insipid or even distasteful, and it has been shown by the distinguished Russian physiologist, I. P. Pavlov, whose recent death we greatly deplore, that food which pleases the palate is much more digestible than food which is insipid. Sweets have the additional power of supplying a craving which is sometimes felt, even after a full meal, a fact which is usually recognised by their being placed on the table along with dessert after a public dinner. They satisfy also a vague desire which is sometimes felt at other times, and instead of leading to indulgence in alcohol or tobacco, they supply the place of these stimulants. Over-indulgence in sweets between meals, especially in children, is apt to lead to indigestion, but sweets taken along with, or just after, meals are of advantage.'"¹

Sir Lauder Brunton was an original vice-president and a good friend of the National Food Reform Association. I am, therefore, not likely to underrate his views. Not only, however, was the draft of *Facts for Patriots*, the line taken in which regarding sugar is impugned by your correspondent, submitted to Sir Lauder Brunton, but also the final proof, carrying in suggestions made by himself

¹ Reprinted, by permission, from the *Manchester Guardian*, April 11th, 1918.

and others. Accordingly, so far from upsetting my contentions, his support may be confidently claimed for such statements as the following: "Cheap sugar and tea," remarked the *British Medical Journal* (February 12th, 1910), "have done disservice to our people." In expressing his cordial agreement with this view, Dr. Chalmers Watson adds: "Sugar, after all, is used as an extra, and not as an article of diet." "Sugar is a concentrated food, and should therefore be taken in moderation. Its indiscriminate addition to so many articles of food is greatly to be deprecated." "Sugar is used far too freely in the kitchens of the United Kingdom, as of America, a practice responsible for much digestive trouble, besides involving loss of variety and of flavour." It has often been suggested by me—with only too much truth, I fear—that sugar is used in this country like pickles and sauces, to conceal from ourselves our unscientific, monotonous, and unappetising cookery. "The Pudding Lady," Miss Florence Petty, has shown the better way of remedying these defects and of enforcing the important truths regarding savour and digestion, to which Sir Lauder Brunton calls attention. Having on more than one occasion of late years discussed in your columns the subject of sugar from the special point of view of children, I do not feel justified in repeating my arguments when your space is of exceptional value. It cannot, however, too often be insisted that sugar, sweets, and jam are not permissible substitutes in a child's diet for fat in the form of butter, margarine, or dripping (see *The Importance of Fat in Diet* and *The Feeding of Children in War Time*, as well as the publications referred to in my letter of the 5th inst.). It only remains to be stated that the eminent authorities in England and America, whose humble follower I claim to be, are at one with Sir Lauder Brunton in recognising the value of sugar and dried fruits for soldiers, mountaineers, or any subject to extraordinary muscular exertion or especially physical fatigue. Other people should bear in mind that sugar is simply converted starch, and that it is their own business to manufacture their own supply.¹

CHAS. E. HECHT,

Hon. Secretary, National Food Reform Association.

¹ Reprinted, by permission, from the *Manchester Guardian*, April 17th, 1918.

SUGAR IN BABIES' BOTTLES.

[Untold harm is done to little children by the all too common practice of putting sugar, which an infant cannot digest, into babies' bottles. A French doctor holds it responsible for more than half the 80,000 infants who die annually in France. A very young mother observed that sugar made children restless and then bad-tempered. Indeed, her chief objection to many of the patent foods was that they contained sugar and gave children a craving for sweet things. Such foods also play havoc with the teeth and digestion. For full information as to the place of sugar in children's diet, see *Facts for Patriots*, 4d., pp. 47-50; *Why Worry About Sugar?*; and *The Sugar Habit*, 1d.—Ed.]

SUGAR AND DENTAL CARIES.¹

BY A. C. FONES, D.D.S.

[The extract that follows is from an American dentist, Dr. A. C. Fones, of Bridgeport, Conn., whose reforming activities have gained for him a world-wide reputation. The writings of Horace Fletcher have made the name of Dr. Harry Campbell known to countless Americans, apart from his eminence in his own profession, so that his opinion may be fittingly given here.—Ed.]

Cane sugar has been used for hundreds of years by different nations, and they have invariably shown a susceptibility to dental decay. Free sugar is not a natural food and Nature never intended that it should be extracted from the cane and beet to be consumed in excessive quantities, as it is to-day.

When we consider that dental caries can only be produced from starch and sugar and that the starch must be reduced to dextrose before it can be converted into lactic acid, it is quite truthful to make the statement that all dental decay is produced by sugar.

Clinical experience and general observation, however, seem to show that the high consumption of starchy food, if unaccompanied by free sugar, does not result in dental decay. In fact, the evidence is all against the sugar. Among the

¹ Reprinted, by permission, from the *Journal* of the American National Dental Association, 1920.

peasant classes of Italy, Greece, the Balkan States, Germany, etc., where the diet consists mainly of coarse foods, vegetables, and fruits, but where free sugar is a luxury and cannot be indulged in, decayed teeth are the exception and not the rule. This is also true of the Esquimos, the African Negroes, the American Indians, the Maori, and many of the South Sea Islanders. During the examination of many hundreds of mouths, especially those of Italians, it was noted that many of them had thirty-two perfect teeth without a cavity or filling, and yet these men had reached the age of twenty-one without even owning a toothbrush, and had consumed quantities of starchy foods. They stated that they did not care for sweetened foods, and it was found later that the free sugar consumption in Italy averages but thirteen pounds per head per year—less than a teaspoonful a day.

The medical profession is, to a great degree, responsible for this situation, for the family physician has taught mothers to believe that free sugar is an essential food for growing children.

OPINIONS, ANCIENT AND MODERN.

A FAMOUS BRITISH DOCTOR'S OPINION.—“Before man learnt to till the soil,” wrote Dr. Harry Campbell in *The Practitioner*, June, 1919, “his supply of pure sugar was limited to wild honey. Now he extracts thousands of tons from artificially grown sugar cane and beet. The consumption of sugar has within recent times increased enormously in our country and many people eat much more than is good for them. At one period of the war fear was expressed lest the people would suffer in health from the dearth of sugar. The belief was widespread that sugar in the pure form is necessary to health, but seeing that all the digested starch enters the blood as sugar, this view is manifestly erroneous. Sugar is not an essential article of diet at any period of life.”

THE PRACTICE OF SWEET EATING.—“The practice of eating sweets,” adds Dr. Campbell, “should be discouraged—they should certainly never be taken between meals, but at meal-time just before the last course. The worst time to take sweets is at bedtime. This is a sure way of setting up dental caries. If eaten between meals they should be followed

by fruit to cleanse the mouth, or it should be well rinsed out with water. It would be a good thing for the health of the country if all sweet-stuff shops were done away with; not because sugar is in moderation harmful, but because these shops encourage its consumption at injudicious times."

ARISTOTLE ON SWEETS.—"From the earliest times," said Professor H. P. Pickerrill, M.D., M.D.S., L.D.S., Otago, at the Sixth International Dental Congress, 1914, "there has been an assumed association between variation in diet and the occurrence of caries. Aristotle thought that particles of sweet things which remained between the teeth occasioned decay of the teeth. A Maori Tohunga informed me that his people all had quite sound teeth until they began to obtain the *pakeha huka* (sugar); a pakeha Maori (white man living with Maori) informed me that it was quite clear why the Maori had good teeth and the Europeans bad; because the former lived 'closer to Nature,' which probably is true, but requires further analysis."

II.—CARBOHYDRATES AND CARBOHYDRATES.¹

TWO SCHOOLS OF THOUGHT?—Although it is generally accepted that dental caries is due to the fermentation of carbohydrates around the teeth, there is still a wide divergence² of opinion as to the part played by the various foodstuffs included in that group. Dr. J. Sim Wallace and others maintain that the cause lies in the decadent character of the carbohydrates used at the present day, the removal of the fibrous element and the fine division of the starch particles making the foods, when prepared for consumption, into a soft, sticky mass which requires but little mastication and tends to cling about the teeth. Dr. Stanley Colyer, who has criticised this view,³ holds that the cause of caries is to be found in the introduction into the diet during recent

¹ A translation, reprinted, by permission, from *The Lancet*, November 29, 1919.

² We do not note any wide divergence of opinion with regard to the views held by Dr. Sim Wallace and Dr. Stanley Colyer. Indeed the editor of the *Revue Belge de Stomatologie*, Dr. H. Allaeys, says, "La théorie de Colyer n'est que la théorie de Miller avec la modification de Sim Wallace." Great stress is laid by Dr. Sim Wallace on sugar as a causative factor, and all sugars, he points out, are fermentable.—Ed.

³ *Dental Record*, vol. xxxvi, No. 1; vol. xxxvii, No. 9; vol. xxxix, No. 11.

years of unstable carbohydrates represented by the fermentable sugars and soluble starches. The result of his observation on the diet of certain African tribes would seem to support the view he holds :

SOME AFRICAN DIETS.—(1) The Barotzi, a people living on either side of the Upper Zambesi, have as their chief foods cassava and mealies. Cassava is a shrub with large tuberous roots, which, after soaking and drying, is pounded into a fine white powder, possessing a large, but very finely divided, fibrous constituent. It is prepared for eating by sprinkling the powder with water which has been just brought to the boil and then stirring with a stick, the resultant mixture being an elastic and rather sticky mass. Mealies are also prepared as a thick glutinous mass. The food requires very little mastication and tends to cling about the teeth, which are not cleaned after meals. Now, amongst the Barotze caries is uncommon, while marginal gingivitis and periodontal disease are extremely common. The caries which does occur progresses slowly and seldom if ever starts on the approximal surfaces of the teeth.

(2) Amongst the natives living near or upon the Lakes Mweru and Bangweulu, whose staple food is red millet, periodontal disease is very common, but caries is even less common than in the Barotze, only one tooth in 270 being carious. The comparative freedom from caries in these two groups, Dr. Colyer remarks, cannot be due to the self-cleansing action of the foods, for they are soft and sticky, nor can the immunity from caries be attributed to the absence of carbohydrates, for the foods eaten contain a high percentage of this element ; cassava about 20 per cent., maize and millet about 70 per cent. These foodstuffs, however, do lack the presence of easily fermentable carbohydrates in the form of the various sugars.

. (3) In the Transkeian territories the staple foods are mealies and Kaffir corn, but in addition a considerable quantity of sugar is eaten ; the sugar is mixed with the porridge, is sometimes taken raw, and two, or at times three, teaspoonfuls are added to each cup of tea or coffee consumed. Mothers give sugar to their children by day and sometimes at night to pacify them. Amongst these natives caries of the teeth is

common, the interstitial surfaces being frequently attacked. Natives are seen with dentures completely ruined by caries. Caries of the incisors is common, and the young are as frequently affected as their elders. Periodontal disease, on the other hand, is comparatively rare.

CONCLUSION.—To sum up. In the three groups of natives referred to the staple foods are similar; among the two groups comparatively free from caries sugar is not used, but in the third group where caries is prevalent sugar forms an article of diet. These facts certainly support Dr. Colyer's view that the fermentable sugars are the important factor in the production of dental caries.

PYORRHŒA ALVEOLARIS. A THEORY AS TO ITS ETIOLOGY.¹

By STANLEY COLYER, M.D. Lond. (*Elliot, South Africa*)._t
[Pyorrhœa is so deadly a disease that light thrown upon it from any quarter cannot but be welcome. An instructive by-product of Dr. Stanley Colyer's African researches into the cause of dental caries is accordingly here reprinted.—Ed.]

AN INCIDENTAL DISCOVERY.—In the course of my investigations into the dental conditions among certain African tribes, investigations pursued chiefly with the object of discovering the real causes of dental caries, a curious distribution of the disease known most generally as pyorrhœa alveolaris came to my notice. I observed that among the Barotzi along the Upper Zambesi, and other tribes living in the neighbourhood of Lakes Mweru and Bangweulu, that whilst pyorrhœa alveolaris was a common disease, dental caries was comparatively uncommon, whereas among natives living in the Transkeian territories (South-East Africa), the reverse was the case. On the assumption that dental caries was a food disease, the deduction, after a consideration of the various dietaries, was that it was due chiefly to the inclusion of commercial sugar into the diet of the latter.

Is PYORRHŒA A FOOD DISEASE?—Now it is possible, assuming that pyorrhœa alveolaris is also a food disease, to show

¹ Reprinted, by permission, from *The Dental Record*, October 1st, 1920.

that there is a certain fundamental difference in the food of these natives which may be, and probably is, the cause of this condition. Having found this essential factor, in order that it may be exalted to the position of one of world-wide importance, it must be shown that the pathological state that it brings about may be likewise induced by the food of all people suffering from the disease.

The pyorrhœa alveolaris of which I speak is the general chronic periodontitis with accompanying changes in the structure of the alveolus and of the teeth. It is progressive and possibly differs in its origin from other cases that may be due to direct infection, following injury, or in general septicæmic states. It begins, so dental surgeons say, as a marginal gingivitis, and its earliest clinical evidence is a destruction of the interdental papilla. *It does not, however, follow that the interdental papilla is the first part of the gingival margin to be attacked.* It is a widely spread disease, and though it may occur independently of civilisation, it follows closely its movements. Wild animals when brought under domestication suffer, though in a state of nature they are but rarely attacked.

It is fair then to assume that there is some underlying condition brought about by the modern ways of living which is common to civilised and uncivilised beings as well as to domesticated animals which will account for this disease. Elsewhere I have shown from certain theoretical considerations that dental caries, most probably, arose after the discovery of cooking, and I endeavour to prove in this paper that pyorrhœa alveolaris also dates its origin from the same epoch, and that it is dependent upon the quality of the food consumed. To do so I propose to commence by reconsidering the foodstuffs of the tribes I have studied in Africa.

LIST OF FOODSTUFFS.

BAROTZI, AND NATIVES NEAR LAKES
MWERU AND BANGWEULU.

I. GRAIN.

- (a) Indian corn (mealies)
- (b) Millet, of various kinds
- (c) Kaffir corn, varieties of
- (d) Wheat, very small quantities
- (e) Rice, very small quantities

S.E. AFRICAN NATIVES (EAST GRIQUALAND).

- (a) Indian corn (mealies)
- (b) Millet, in small quantities
- (c) Kaffir corn, varieties of
- (d) Wheat in small quantities
- (e) Rice, imported only

BAROTZI, AND NATIVES NEAR LAKES
MWERU AND BANGWEULU.S.E. AFRICAN NATIVES (EAST GRIQUA-
LAND).

II. VEGETABLES.

(1) *Above ground*—

- (a) —————
- (b) Beans and peas of various kinds (seeds only eaten)
- (c) Pumpkins

(2) *Underground*—

- (a) Cassava
- (b) Monkey nuts, in fairly large quantities
- (c) Sweet potatoes and allied corns, large quantities

(1) *Above ground*—

- (a) European potatoes
- (b) Beans and peas of various kinds (seeds only eaten)
- (c) Pumpkins

(2) *Underground*—

- (a) —————
- (b) Monkey nuts, in small quantities
- (c) Sweet potatoes, etc., very scarce

III. FLESH FOODS.

- (a) Oxen, sheep, goats, rats, etc., and that of game, animals and birds
- (b) Caterpillars, insects, flying ants, etc.
- (c) Fish, mostly dried, in fair amount

- (a) Oxen, sheep, goats and chickens (game, killed out)
- (b) Caterpillars, etc., said to be eaten by raw Kaffirs only
- (c) *Fish*, very scarce

IV. SAVOURIES AND RELISH FOODS.

- (a) Leaves of wild spinach, pumpkin, cassava, etc.
- (b) "Salt" in small quantities in some districts, large quantities in other
- (c) Sugar cane and honey in small amounts
- (d) Sugar, consumed by rich only and not much used
- (e) —————
- (f) Roots of certain kinds in season

- (a) Leaves of pumpkin, potato, and other plants
- (b) "Salt," all purchased from stores
- (c) Sugar cane very rare
- (d) *Sugar*, a common article of diet
- (e) Pepper and curry powder
- (f) Roots, etc., eaten by raw Kaffirs

V. DRINKS.

- (a) Kaffir beer, either fermented or unfermented
- (b) Milk, fresh and curdled
- (c) Water
- (d) Tea and coffee, rare

- (a) Kaffir beer, either fermented or unfermented
- (b) Milk, fresh and curdled
- (c) Water
- (d) Tea and coffee in large quantities

SOME NATIVE STATISTICS.—I have already said that pyorrhœa alveolaris among the Transkeian natives (South-East Africa) is comparatively uncommon, whereas among the Barotzi and those dwelling near Lakes Mweru and Bangweulu it is rampant. The extent of the disease among the Mweru and Bangweulu natives will be evident from the figures that I collected from one thousand male natives examined successively. Three decades of life are dealt with and the extent of the disease is

divided into three degrees: (1) all cases showing early suppuration—nearly always around the anterior teeth—to complete but not severe infection of the whole set; (2) severe and incurable cases; (3) advanced cases with marked loosening and loss of teeth.

Age.	Number.	Free of the Disease.	1st Degree.	2nd Degree.	3rd Degree.
10 to 20 years ..	246	8	225	12	1
20 to 30 years ..	670	35	586	47	2
30 to 45 years ..	84	0	51	25	8
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
	1,000	43	862	84	11

(I regret that I have no figures for the Barotzi or the Transkeian natives.)

ESSENTIAL CAUSE OF PYORRHŒA.—A glance at the list of foodstuffs would appear to show no great difference between those of the respective people under consideration. The South-East African natives are not so careful in the winnowing of their grain, and are fond of eating cooked mealies which are merely bruised, but I do not think that these differences are sufficient to account for their comparatively remarkable freedom from pyorrhœa alveolaris. I think rather that the essential difference lies in the fact that they do not possess the root known as cassava. This root, when dried, crushed, and prepared for food, forms an unpleasant-smelling, stodgy, elastic and rather sticky mass. It is the main food of the Barotzi, especially of those living away from the Zambesi, and it is considered by the Barotzi themselves to be the cause of the present state of their teeth—a view with which I certainly agree. This root, cassava, is grown and freely eaten by the people around Lakes Mweru and Bangweulu, and their teeth are comparable in all ways to those of the Barotzi. If we go farther east we come to the parts where it ceases to be grown and there is a corresponding improvement in the teeth.

Both the Barotzi and the South-East African tribes are rich in cattle. Among the latter it is more evenly distributed, so that proportionately more people eat meat than among the former, and as there is no question that they do not suffer from the disease as severely as the Barotzi, it is difficult to attribute the cause of the disease to meat eating.

Moreover, it must never be forgotten that putrefactive and proteolytic changes take place in epithelial tissue shed from the mucous membrane of the mouth and that this process appears to be the normal method of removing waste tissues in interdental spaces.

In the last edition of *Dental Surgery and Pathology*, by my brother, it is stated (p. 565) that "the evidence points to the disease being started by injury of the gingival margin from food debris, or by the local action of toxins as seen in the marginal gingivitis of mouth-breathers."

CHARACTER OF PRESENT-DAY DIET.—"The prevalence of the disease is probably due to the character of the diet of the present day. Much of our food is now prepared in such a manner that it readily accumulates around the teeth and is of a character which easily undergoes fermentation." Later in the same work it is explained that the difference between caries and periodontal disease is that caries is due to enzyme action on carbohydrates, periodontal disease to enzyme action on proteins. "Made-up dishes" are supposed to be worse than "plain, fresh-cooked food" but for what reason is not stated. Lastly, imported frozen meat is added to the list of "suspect" foodstuffs because it undergoes putrefactive changes more easily than fresh animal food. It is thus clearly laid down that the disease is due to the local action of toxins formed from animal protein, which has either been introduced into the mouth or consists of epithelial debris—waste cells of the mucous membrane. The important question as to why modern meat should cause this disease is answered by saying that meat is frequently consumed as "made-up" dishes, and imported frozen meat is more liable to undergo putrefactive changes than freshly killed meat. *Putrefactive change in protein debris is obviously considered to be at the base of this condition.* Without adducing arguments, I will content myself with saying that I consider this view to be wrong, and I believe that though protein may be in some slight degree responsible for bringing about the earliest stages of this disease, the chief rôle must be assigned to the carbohydrates, and that bacteria play no part until the disease is established—clinical pyorrhœa being of the nature of a secondary infection.

SOFTNESS OR STICKINESS.—I showed, many years ago (1904), that soft food *per se* was not the cause of dental caries, if for no other reason than that it could not explain the position at which the earliest changes of interstitial caries occurred. Likewise the decomposition of soft food *débris* at the cervical edge cannot satisfactorily explain the distribution of marginal gingivitis which is *general to a few teeth and not local except in cases of definite injury*. In the case of dental caries my deduction from the evidence was that the food that underwent acid fermentation was *in a state of solution* and was held interstitially by capillary attraction ; so in the case of marginal gingivitis the evidence leads me to the conclusion that the disease is due to food in solution, held at the festoons of the gum margin and in the interstitial spaces by the same force. It is not necessary for me to prove that the spaces between the gum margins and the teeth, and between adjacent teeth, are capillary spaces, but anyone who has a doubt should wash his mouth out with a coloured and rather viscous fluid, and subsequently examine his teeth in a mirror. He will then see the margins of his gums clearly outlined by the fluid.

I have stated that the essential difference between tribes markedly affected by pyorrhœa and those who are not, is the presence in the food of the former of a sticky glutinous food known as cassava. It is this quality of stickiness in the food whereby it is enabled to be held in capillary spaces and, owing to its indiffusibility with the saliva, to remain in position for some time, that would seem to determine the disease. Mere softness of food, neglect of oral hygiene and the consumption of animal food, none of these seem to have a clear claim.

THE PART OF COOKED CARBOHYDRATE FOOD.—It is my contention that it is chiefly the cooked carbohydrate food which is held by capillary attraction in the festoons of the gums and the interdental spaces which leads to the earliest stages of marginal gingivitis. This, I will endeavour to show, is primarily due to physical damage to the superficial cells and not to bacterial destruction of waste food material. The theoretical proof of my contention is by no means an easy matter, and involves an incursion into modern physiology which I am fearful of taking ; but if my theory is to have any

support other than what I have drawn from clinical observation I am compelled to make it.

CHANGES RESULTING FROM COOKING.—Evolutionary history would seem to show that an animal which has evolved to its environment remains in health so long as its environment does not change. Any change that may occur calls upon the adaptability of the animal, and any failure to adapt itself spells disease and possibly extinction. In diseases that have led to the destruction of animals in the past, dental disease may have played its part, for it is said that certain fossil remains of minosaurs and plesiosaurs of the cretaceous era were affected with general periodontitis. So man, we may assume, evolved more or less perfectly adapted, but being of a wandering and insurgent nature, was constantly changing his environment. Disease was the natural outcome, and of these there are few more common than the one under consideration. Cooking was one of the most important environmental changes to which man had to adapt himself, and I wish to draw attention to certain changes that it brings about in food which, in my opinion, are the cause of general periodontal trouble.

The effect on carbohydrates is to break up the starch grains by bursting the cellulose capsule, thus freeing the granulose (starch particles) which are partly soluble in hot water—producing when concentrated what is known as mucilage of starch.

The effect on animal food is to convert the insoluble collagen of connective tissue into *soluble gelatine*.

From my point of view the important change that cooking has brought about is that it produces a more gelatinous kind of nutriment. It is obvious that such food is more viscous and adhesive and, if once established in capillary spaces, will not readily be removed by diffusion with saliva. It thus remains in contact with the marginal epithelium and is not washed away as is uncooked food. It is this prolonged contact which leads to damage to the superficial cells which is the first stage of marginal gingivitis, the damage being of a physical and not a bacterial nature.

Now, ordinarily speaking, a cell remains normal if it is surrounded with an isotonic solution which does not damage

the cell membrane. If the solution is not of this nature a damage to the membrane occurs which increases its permeability. And here it may be noted as a matter of some dental interest that of all non-electrolytes used in physiological experiments cane sugar in isotonic solution appears to be the least injurious to the cell membrane, though in time it will increase its permeability. Consider now the influence of saliva on the mucous membrane. As saliva is of variable constitution, it cannot always be isotonic with the cell contents of the mucous membrane, but, as these remain normal under its influence, there must be something in the saliva which keeps intact the cell membrane and so prevents undue osmosis. This substance is *calcium*, and there is strong physiological evidence to show that calcium is a cell restorative and capable of rendering a cell membrane made permeable once again impermeable. It thus follows that when saliva can circulate freely over the mucous membrane of the mouth it can restore that tissue should its cell-impermeability have been temporarily upset by contact with substances rendering it more permeable. In pre-cooking days, when the majority of the food taken was of a non-viscous nature, its contact with the mucous membrane was momentary, and any damage it may have inflicted was immediately remedied by the salivary wash.

ACTION OF FOOD UPON THE MUCOUS MEMBRANE.—It follows from the above that food may act in three distinct ways upon the mucous membrane :

- (1) By contact it may damage the cell membrane, leading to an increased permeability of the cell wall ;
- (2) Prolonged contact allows of abnormal osmotic interchanges either towards or away from the cell, depending upon whether the food solution is hypotonic or hypertonic towards the cell contents.
- (3) It prevents the wash of the saliva and so interferes with the restorative action of the calcium.

A pathological condition is thus established which, if continued, must lead to the destruction of the superficial cells, which, in their turn, will affect subjacent cells. Their dying and dead bodies become irritant by virtue of chemical

products of the disintegration of the protoplasm brought about by autolysis, and thus an inflammation of a non-bacterial type is induced. Bacterial infection is grafted upon the above state, and a disease which is induced by physical cause is continued as a bacterial infection.

PREVENTION—HOW ATTAINABLE.—The prevention of the disease would seem to be simplicity itself, for the essential thing is merely to get rid at the end of each meal of that dangerous layer of food material held at the gum margins. To reach that end we may return to pre-cooking days and eat only of the natural products of Mother Earth, or, if we would rather adapt ourselves to the conditions that have arisen, we may follow the custom of certain natives who massage their gums and swill out their mouths after each meal, or we may adopt the probably less efficient methods of eating acid fruit or take salivary stimulants, or we may carefully cleanse our teeth and gums by the judicious sucking of our teeth—a process one might call auto-cleansing.

There, for the present, I leave this theory to the consideration of those whom it may interest, in the hope that it may open up a new line of approach along which this important disease may be attacked.

NOTES.—Full particulars of the foodstuffs of the African tribes under consideration will be found in the papers referred to below.

CASSAVA (better known as manioc). The Indian varieties contain about 1 per cent. of proteids and of fats, 15 to 30 per cent. of starch. Tapioca is a refined product of cassava and contains about 86 per cent. of starch.

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THE PROBLEM OF PYORRHŒA ALVEOLARIS AN ADDITIONAL NOTE.¹

BY STANLEY COLYER, M.D.Lond.

STAPLE AND SEASONAL FOODS OF INDIANS.—The Editor in forwarding me the proof of my paper on pyorrhœa,² asked me how I could explain pyorrhœa alveolaris among rice-eating races such as the Indians, Javanese, Chinese, and Japanese, and I am adding this short addendum on the food of the Indians, which may serve to anticipate certain criticisms and strengthen my paper, in the writing of which I intentionally sacrificed detail that the argument might remain clear.

In the first place you cannot speak, without misleading others, of a race as rice-eating or maize-eating, as all races are mixed-eating, having certain foods as staple or customary, and others as additional or seasonal.

LIST OF FOODSTUFFS OF INDIANS.

I. GRAIN.

- (a) Indian corn.
- (b) Millets of various kinds, including the ragi (*Eleusine corocana*).
- (c) Kaffir corn, or great millet.
- (d) Wheat, barley, buckwheat.
- (e) Rice.

II. VEGETABLES.

- (1) *Above ground*—
 - (a) _____
 - (b) Beans and peas of various kinds.
 - (c) _____
 - (d) An abundance of other vegetables and fruits, such as egg-plant, papaya, banana, etc.
- (2) *Underground*—
 - (a) Cassava, known in India as manioc.
 - (b) Monkey-nuts.
 - (c) Sweet potatoes and allied corns.

III. FLESH FOODS.

- (a) Oxen, sheep, goats, etc.

¹ Reprinted, by permission, from *The Dental Record*, November 1st, 1920.

² Appeared in our October issue.

III. OILY FOODS.

- (a) Butter and ghee (melted butter).
- (b) Oils expressed from monkey-nuts, coco-nuts, soy-beans, etc.

IV. SAVOURIES AND RELISH FOODS.

- (a) Volatile and essential oils and other aromatic compounds contained in garlic, turmeric, pepper, spices, etc.
- (b) Sugar in various forms.

V. DRINKS.

- (a) Alcoholic.
- (b) Milk.
- (c) Water.
- (d) Tea and coffee.

LOCAL VARIATIONS.—The above list of Indian foodstuffs which I have compiled from Simpson's *Hygiene in Tropical and Sub-Tropical Climates* (1908), is nothing more than a general statement and cannot be said to apply definitely to any one section of India. Thus, although "rice, ragi, millets, maize, and other cereals form as a rule the staple foods of the tropics," Professor Simpson states that "the principal article of food in Bengal, Burmah, Madras, and Assam is rice, mixed with pulse, and a little ghee or melted butter . . . whereas in Northern India, which is not a rice-growing country, the millets and pulses are eaten by the poor, while the richer classes are able to afford wheat and barley. Indian corn is eaten by all. There are Hindus who take no animal food beyond that of milk and ghee"—and so on (p. 133).

As I am not familiar with Indian life I cannot speak with first-hand knowledge either of their foods or habits. Moreover, I do not wish to comment on their diet save to point out its general similarity with that of the African, and to remark that if cassava does not enter largely into their food, the millets, which contain large quantities of gluten, do, and further that sugar and sweetmeats are a national failing.

A THEORY RESTATED.—The thesis of my paper may be said to be that pyorrhœa alveolaris is due to soluble food of a viscous nature being held against the gingival margin for a sufficient length of time to lead to damage of the walls of the epithelial cells. Save in a few instances, soluble viscous substances of this nature are not present in the uncooked food of man. They are, of course, present in uncooked

wheat and millets in the form of gluten, and in certain sticky fruits such as dates. Sugar and sweetmeats, especially gelatines and jujubes will, when sucked, give rise to similar sticky and viscous substances. All these are capable of producing the conditions I regard as essential to the production of the disease.

I intentionally contrasted the foods of certain African tribes so that I could clearly show that cassava seemed to be the cause of the disease; but my ambition was to make plain that the cooking of foods leads in many cases to the production of soluble starches which may form a mucilaginous kind of food, and to gelatinous food from the transformation of collagen. That is my generalisation; and if it cannot explain the geographical distribution of the disease it is incorrect.

RELATION OF CARIES TO PYORRHŒA.—A word as to the relation of dental caries and pyorrhœa alveolaris may not be inopportune here. I have long felt that the ætiologies of these two diseases were closely related, and that the epoch of cooking was the one to which their modern types could be traced; but it took me many years to realise what their relation might be. Caries, I believe, is due to the introduction into man's diet of the more easily fermentable carbohydrates, represented by the various sugars and soluble starches, and pyorrhœa alveolaris is due to the same causes, plus the introduction of gelatines formed from collagen. The means by which these produce the respective diseases is probably entirely different. Moreover, pyorrhœa once definitely established has an inhibitory action on caries of the enamel, and that very fact is, to my mind, one of the strongest arguments against Eckermann's osmotic theory of caries.

SOME EXPERIMENTS ON BREAD, WITH SPECIAL REFERENCE TO THE CAUSATION AND PREVENTION OF DENTAL CARIES.¹

By J. SIM WALLACE, D.Sc., M.D., L.D.S.

[Dr. Sim Wallace's valuable experiments regarding the respective merits of stone and roller-milled flour and upon bread and marmalade, are almost as classic as those cited by him. His paper should be read side by side with the contribution from Miss May Yates, since each, to some extent, supplements the other.—Ed.]

RELATIVE ACIDITY OF BREAD.—I never was quite satisfied with some experiments carried out by Mr. H. Candy under the direction of Mr. T. G. Read, and for many years hoped to see them corroborated or refuted.

These experiments were said to show that during mastication ordinary steel-milled white bread gave rise to 43 per cent. more acid than did bread made from stone-milled flour. They appear to have given rise to the impression or assumption that white bread fermented more rapidly in the mouth than did bread made from stone-milled flour. It was impossible to gather from the published reports the significance of Mr. Read's experiments. I, however, accept the statement about the extra 43 per cent. of acid being produced from the white bread, but only on the supposition that, to all intents and purposes, no acid is produced during the mastication of the stone-milled bread, and that 0+43 per cent. of 0 is produced during the mastication of the white bread. When stone-milled bread and when white bread are masticated and then ejected into a suitable vessel, it will be found that both are distinctly alkaline. Moreover, if equal amounts of bread made from stone-milled flour and from white bread are masticated, and each put into an incubator and left to ferment for a number of hours, they ferment fairly exactly at the same rate. (Dr. Leonard Hill has shown the same result with regard to standard bread.) In fact, at

¹ Reprinted, by permission, from the *Proceedings of the Royal Society of Medicine*, June, 1911.

least in my experiments, the stone-milled bread actually showed a slightly greater amount of acid than did the white bread.

AN EXPERIMENT DESCRIBED.—Here I may indicate the kind of experiment which I made to illustrate this point : 200 gr. of white bread were thoroughly masticated, and then, instead of being swallowed, they were put aside in an incubator and left there for twelve hours. Water and litmus solution were added, and neutralised with a 0·5 per cent. solution of caustic potash. The number of cubic centimetres of this solution required to neutralise the acid was noted. Similarly, 200 gr. of stone-milled bread were subjected to like treatment. These experiments were repeated several times, with the slight variation that in some cases the stone-milled bread was masticated first and the white bread immediately after ; in the other cases the white bread was masticated first and the stone-milled bread immediately after. The reason for trying the amount of fermentation in both of these ways will be apparent later. The exact figures showing the average amount of acid formed in twelve hours from 200 gr. of bread treated in this way are : Stone-milled bread (crust and crumb) required 14·7 c.c. of the K.H.O. solution (average of twelve experiments) ; white bread (crust and crumb) required 14·0 c.c. of the K.H.O. solution (average of twelve experiments).

SOME FALSE ASSUMPTIONS.—Before referring to my next set of experiments I would like to allude to the late Dr. Miller's famous experiments. These, together with the enormous influence for good in regard to the solution of the pathology of caries, have misdirected attention, to a certain extent at least, with regard to its ætiology. They were conducted as follows : 5 gr. of the foodstuff were mixed with 4 c.c. of fresh-drawn saliva, left to ferment, and the degree of acidity tested in a similar way to that already indicated. Here, however, the experiment does not in any way represent a state of affairs such as is liable to exist at the exact sites where caries commences. If one looks into the crevices of the teeth, which are the usual sites of caries, after a meal has been taken ending with bread, it will be seen that covering over and extending beyond the incipient carious spot a visible

quantity of bread may be seen. It is not, then, less than 1 per cent. of bread in saliva that we have to deal with, we have rather to deal with the foodstuff and the saliva in more like equal proportions. In fact, when some foods are eaten, chocolate for example, for a considerable time the chocolate lies in the crevices almost without admixture with saliva at all. One cannot really object to Miller's experiments or methods, however, but only to the erroneous assumptions made from them. Thus, it has been assumed that the harmfulness of any particular foodstuff might be judged from its fermentability. To a certain extent this is, no doubt, true, but it is of still greater importance to know first: (1) Whether the particular foodstuff is apt to lodge about the teeth for a considerable time, and (2) whether the foodstuff may itself have been effectual in removing the bacterial plaques or masses from the masticating surfaces of the teeth. Again, it has often been assumed that the mouth is more or less constantly supplied with something approaching 1 per cent. of carbohydrate, remaining behind in the mouth after practically all meals, and, consequently, some acid being formed in the mouth. The whole theory that the *locale* for the initiation of dental caries depends on points of least resistance in the tooth is largely based on the assumption that there was in the mouth a diffuse production and presence of acid in a medium—*i.e.*, the saliva—which might only contain a fraction of 1 per cent. of carbohydrate. Similarly, the theory that acids in foods, acid saliva, and acids eructated from the stomach gave rise to caries, seems to have gained currency on the assumption that the food and acid, which tended to initiate caries, was not located in the mouth at a particular spot, and that the acid formed was not, as it were, fixed or located, but wandered about till it found points of least resistance. It is not, however, such points which are important. But it is most important to recognise the existence of points which favour the periodic stagnation of carbohydrate foodstuffs in appreciable quantity, for it is there that caries is invariably initiated, and whether the tooth-substance in the neighbourhood of these spots is more or less resistant to solution by acid does not in any way influence the intensity of the carious process, although it *may* influence the rapidity of the destruction of the tooth-

substance. It appeared to me, therefore, that it would be more satisfactory to try, to a certain extent, to imitate the degree of concentration of the foodstuffs in the saliva at the exact seat of the incipient carious spot.

SEEKING MORE LIGHT.—At first, in order to try to ascertain in what form bread might give rise to the most rapid fermentation, but subsequently to ascertain in what form bread was most detergent, I masticated equal quantities (200 gr.) of the crust and crumb, each separately, and noted the resultant amount of acid produced after incubation for twelve hours. The average amount of acid produced in this way was as follows :—

200 gr. crust of bread (white stone-milled and standard) produced on the average an amount of acid which required 16·8 c.c. K.H.O. solution to neutralise it (average of eighteen experiments).

200 gr. bread without crust produced on the average an amount of acid which required 13 c.c. of K.H.O. solution to neutralise (average of nineteen experiments).

CRUST VERSUS CRUMB.—Notwithstanding these results, it must not be imagined that crust of bread ferments more rapidly than crumb, or is more liable to induce caries than crumb; on the contrary, the amount of fermentation indicates rather how effectually each or any of these varieties of bread cleans the masticating surfaces of the teeth, and removes the plaques or masses of bacteria which, by lodging unduly and protected from the beneficent action of the saliva by superimposed bread, would induce caries.

That the greater amount of fermentation from the crust results from its incorporating greater numbers of bacteria is indicated by the fact that 200 gr. of crust masticated before a meal give rise to much more acid than when the same amount is chewed after a meal, or even after the first 200 gr. have been masticated and ejected from the mouth. Thus :—

Crust chewed before breakfast required (on the average of nine experiments) 18·6 c.c. of K.H.O. solution to neutralise.

Crust chewed after breakfast required (on the average of eight experiments) 13·3 c.c. of the K.H.O. solution to neutralise.

Crust chewed before breakfast required 19.5 c.c. of K.H.O. solution (average of four experiments).

Crusts chewed immediately after the previous crusts had been chewed required 16.2 c.c. of the K.H.O. solution to neutralise.

While doing these experiments I kept a sound tooth, with the enamel exposed, in the fermenting bread; it being passed on after washing from one experiment, testing the amount of fermentation in twelve hours, to another similar experiment. I only thought of doing this towards the end, and, consequently, it was only in the fermenting medium for seventy-two hours. It was not in the slightest way influenced by the acid fermentation around it. It was my expectation to get this result, to indicate that when bread with crust, or toast, is masticated, the plaques of micro-organisms are generally sufficiently completely removed from the masticating surfaces of the teeth to prevent a rapid production of acid at any one spot on the tooth, even when it lodges for hours at any particular spot. This experiment should have been continued much longer; still, the small amount of acid formed, not from plaques located at a particular spot on the tooth, but from micro-organisms distributed relatively sparsely in the fermentable foodstuff, would not induce caries, even were such fermentation repeated over and over again for several hours, as the saliva would always counteract the decalcifying tendency of the acid formed.

HOW BACTERIA FORMS.—As far, then, as the masticating surfaces are concerned, we may say that the lodging of bread would tend but little, if at all, to induce dental caries, provided the adherent masses or plaques of bacteria could be and were frequently removed, or rather were not allowed to form. Here it should be noted that the nature of the bacterial flora of the mouth in general is not necessarily of much importance. It is quite possible, indeed most probable, that the bacteria in a crevice which is regularly supplied with carbohydrates are of an active acid-forming type, flourishing most rapidly in a carbohydrate medium. Dr. Black said: "As I have cultivated micro-organisms a great deal, and especially in relation to this matter, I wish to say distinctly that the same micro-

organisms are found growing in the mouths of persons who are immune to decay, as are found in the mouths of persons who are susceptible to decay and those whose teeth are decaying rapidly, and the same micro-organisms will grow in the saliva of either when used as a cultivating medium." Nevertheless we are justified in saying that the fact of the same micro-organisms being present in different mouths at points where decay is not taking place is not an important point. What importance, indeed, can we attach to the general bacterial flora, or the nature of the saliva, when at one place we may have decay becoming arrested and at another decay commencing? The exact local conditions and the precise localisation of particular kinds of micro-organisms are the points of paramount importance.

It may be said that, no matter what is eaten, masses of bacteria do adhere about the teeth even after the thorough mastication of crusts or anything else. This is quite true, and between and at the necks of teeth, masses, layers or plaques of bacteria cling to the teeth after masticating anything. Those situations, however, are kept free from caries on a somewhat different principle. There is a coating of mucus in which the bacteria seem to flourish fairly well, but which, however tenaciously it adheres to the teeth, is sufficiently greasy and slippery to permit of the easy and rapid removal of carbohydrate food particles. If the teeth are observed some short time after eating bread, it will be found that this slippery mucoid film is present *in situ*, but not the bread. Food particles occasionally are loosely adherent to this mucoid mass for a time, but they are more or less freely exposed to the action of the saliva, and are superficial and not impacted when there is a normal arrangement of the teeth. The protection of the tooth from caries at the neck should be more closely studied than it usually is.

The deepest layers are the most alkaline and most infiltrated with *liquefying* micro-organisms. This is a necessary corollary from Miller's experiments with saliva and mucus. The superficial parts of this mucous coating are removed and deposited more frequently than the deepest layer next to the tooth. Consequently the deepest part must, generally speaking, be alkaline, even though the superficial and more recently deposited layer be acid, because if mucus is left to

ferment for a time it rapidly becomes alkaline. The micro-organisms, however, keep up a slow disintegration of this mucus, so that a constant change or continual slow flux keeps the neighbourhood of the necks of the teeth alkaline, and at the same time free from any foodstuffs which otherwise might lodge. Towards the bulge of the tooth and above it, of course, the layer of mucus is very thin, and being renewed after each meal it tends to become acid when newly deposited ; but, inasmuch as it is thin, mixed with and bathed in saliva, it would be impossible for it to become sufficiently acid to decalcify the enamel. Saliva, as you know from Head's experiments, effectually prevents the action of weak acids upon the teeth.

WHERE CARIES BEGINS.—It is true that caries often attacks the necks of the teeth. Here, again, however, in order to get this result, food must lodge more or less continuously over or in the layers of mucus and bacteria in these situations. Certain viscous foods—*e.g.*, bread and marmalade, or cake—may certainly lodge upon or partly impregnate the mucous layer over the necks of teeth, or this layer may become fairly thoroughly soaked in sugar when sweets are more or less continuously sucked. Again, foods, even though not of a particularly sticky nature, may be liable to lodge when the mucous membrane forms a sort of pocket near the necks of the teeth on the buccal side of the wisdom teeth. Except in such situations, there is no distinct tendency for food particles to lodge about the necks of the teeth when they are covered with the mucous coating and the gums have not receded. When, however, this mucous coating is frequently removed and a small groove cut with a tooth-brush, the inclined and slippery plane is broken, and food tends to stagnate at the necks of the eroded teeth. Caries may then take place, for fermentable carbohydrates may lodge in more or less immediate contact with the teeth, as the beneficent protection of the mucous coating has been removed, and instead of facilitating the removal of fermentable carbohydrates they are induced to lodge under conditions which favour the initiation of caries.

BREAD AND MARMALADE.—The next and last set of experiments to which I would refer are with regard to bread and

marmalade : 200 gr. of this mixture (160 gr. of bread and 40 gr. of marmalade) were masticated and tested as in the previous experiments, the result being that the bread and marmalade gave rise to acid requiring for neutralisation 11·6 c.c. of K.H.O. solution, while the white bread alone required 12·2 c.c. of the K.H.O. solution to neutralise the acid formed ; that is to say, as far as fermentation was concerned, my experiments might be supposed—if only fermentability were considered—to indicate that bread and marmalade was rather less harmful than bread. To anyone who has made statistical comparisons, the idea that bread and marmalade is no more harmful to the teeth than bread alone is ridiculous. But we must not consider the fermentation alone. Marmalade stimulates a rapid flow of saliva, and, consequently, the bread and marmalade do not require or receive the amount of mastication that bread alone demands. Consequently, bread and marmalade is less effectual in cleaning up the bacteria from the masticating surfaces of the teeth. Secondly, marmalade is viscous and clammy in the mouth, and therefore may stick about and between the teeth, and saturate everything about the teeth, and by its viscosity it may prevent the free action of the saliva cleaning between the teeth or penetrating into the mucous or bacterial coating at the necks of the teeth. The viscosity of sugar is well known, but to indicate how sugar is not removed from the mouth by the saliva, or that it is not easy for the saliva to exert a beneficent effect on anything through the viscous sugar, I masticated some sugar and put it into a test-tube and then left it to ferment. Before fermenting it was, of course, viscous ; twelve hours after fermenting it was still viscous. Similarly, saliva was put into a test-tube and left to ferment ; it was slightly viscous, but compared with the sugary solution, relatively limpid. I put litmus solution into each, and then shook the test-tube round to mix up the colouring matter, but so viscid was the sugar solution, especially towards the bottom, that I could not get the colouring matter to reach the end of the tube. The litmus solution mixed readily with the saliva, but this could not penetrate into the viscous sugary solution.

CAUSE OF CARIES.—Before going further it may be desirable to define the cause of caries, for, although to a certain extent

I am going to make some observations based more or less on the experiments, it is difficult not to be influenced by what knowledge we already have. *The cause of dental caries is the undue lodgment of fermentable but non-detergent carbohydrates in more or less immediate contact with the teeth, and undisturbed by the free access of saliva.*

PART PLAYED BY BREAD.—What can we say about bread in relation to dental caries? We can safely say that:—

(1) No farinaceous foodstuff in general use in this country is less harmful to the teeth than bread when eaten with butter, and no farinaceous foodstuff is more beneficial from the point of view of oral hygiene; especially is this the case when the bread is eaten with a goodly proportion of crust.

(2) The different varieties of bread (*i.e.*, white, standard, and stone-milled) make no appreciable difference in inducing dental caries, beyond the difference which the physical differences of the bread make in their detergent effects on the teeth. That is to say, the less finely ground may be presumed at least to have the more detergent effect. Whether standard bread may be considered as being less finely ground than white I know not, but as far as my experiments on this point go, the fermentation of standard bread and white bread gave identical results in this respect, both for crust and crumb.

(3) The crust is always preferable to the crumb in all varieties of bread. Similarly, toasted bread of any variety is preferable to untoasted bread of any variety.

The amount of phosphates or proteid absorbed from one kind of bread may be greater than from another kind. It is said that more phosphates are absorbed from white than from coarse wholemeal bread. From the point of view of dental caries this does not seem to be of any consequence whatever. It is certainly immaterial as regards the temporary teeth, which have their enamel completely formed before bread is ever tasted.

LIME SALTS.—As to lime salts in bread, and their effect on the calcification of enamel, for similar reasons, we may conclude that this has nothing to do with the production of caries. A certain amount of lime salts is necessary, both for the teeth and for other purposes, but whether it is too much that is in the different varieties of bread or too little seems

of remarkably little consequence. What evidence we have goes to show that the teeth are as excellent in form and constitution whether a diet notably rich in, or notably free from, lime salts is indulged in. Judging from Professor Moore's and Professor Winckler's observation, possibly the breads having the smaller amounts of assimilable lime may be regarded as best from other points of view, especially if supplemented by cow's milk. But we need not speculate on this; we know, of course, that the chemical analysis of the teeth shows that it is not lack of lime salts at all that predisposes teeth to decay. As the impression may exist that in a certain variety of bread there is a deficiency of lime salts, there is all the more opportunity for insisting that a more or less exclusively bread diet should be supplemented with vegetables containing lime salts in ample quantity, and in which the cellulose is present in a more agreeable and less irritating form than in wholemeal bread, besides being in a more detergent and correspondingly hygienic form. Again, if the amount of carbohydrate in white bread is proportionately great, this will give us all the better reason for insisting that jam and marmalade should not be spread upon it, but that it should be supplemented by butter, fish, flesh, or fowl, or other proteid and fatty food. To talk about sugar being a great "proteid sparer," when already too much carbohydrate and too little proteid have been consumed, is on a par with sending coal to Newcastle in order to save the inhabitants of that city from using something else which they could not possibly do without.

HOW BREAD IS EATEN.—Though bread has but little to do with the induction of caries, how it is taken and what it is taken with is of great importance. Thus, the wicked practice of cutting off the crust, or soaking good detergent bread in milk till it has thoroughly lost its power of stimulating mastication and keeping the mouth clean, should be noted. We surely do not want to see the mouth in a continual state of fermentation, teeming with bacterial plaques, and contaminating all the food which has possibly been carefully selected and sterilised for a child's welfare. To ruin the detergent effect of the bread directly is bad enough, but, unfortunately, this is not all, for cow's milk not only contains

an excess of lime salts, it contains also excess of proteids. Thus instead of a child having its bread supplemented by albuminous food of a cleansing nature, it is generally actually deprived of this because it has already got it in its most expensive and least detergent form—*i.e.*, milk.

UNPHYSIOLOGICAL COMBINATIONS.—Bread and marmalade is another of those unphysiological combinations which tend to ruin the cleansing effect of bread, and the habit which many families have of finishing breakfast with bread and marmalade makes it particularly objectionable from the point of view of oral hygiene. Bread and jam¹ to finish off the children's "tea" is, of course, equally harmful.

A GOOD WORD FOR FINELY GROUND WHOLEMEAL.—Although the proportion of salts in white or in wholemeal bread has nothing whatever to do with the chemical composition of the tooth, I am not at all sure that the elimination of the earthy salts or a goodly proportion of the inert and innutritious cellulose is an advantage, especially for those who are found to live largely on bread alone. These earthy salts, and the cellulose which is present in wholemeal bread, may be conducive to the hygiene of the alimentary canal. Whether more proteid is absorbed from the white bread or whether more earthy salts are absorbed from it, is not of any appreciable consequence except for those who are on the borders of starvation. What leaves the mouth and alimentary canal in the most hygienic or healthiest state is what is of importance. It is always disease and never starvation which affects the development of the teeth. The wholemeal bread should not be very coarse, lest it should give rise to intestinal irritation. Possibly, probably indeed, coarse wholemeal bread is suitable for those who masticate their food very thoroughly, but so many do not, and many more cannot. Thus, therefore, although wholemeal bread is to be preferred, especially because of the innutritious matter which it contains, it may be safer to advocate rather finely ground wholemeal bread.

¹ Bread and jam, so largely consumed by the poor, is not a physiological combination, since the bread consists mainly of starch, all of which is digested into sugar. The poor should be encouraged to take butter, margarine, bacon-fat, or dripping with their bread.—Dr. Harry Campbell, *The Practitioner*, June, 1919.—Ed.

For anyone who wants to try the silly experiment of living on one foodstuff *alone*, standard bread may be recommended. Certain experiments at least seem to indicate that such a course would be advisable under such circumstances. But before assuming that this results from "superior nutritive qualities," let us be sure that it is not due to something quite different. The craze for nutritive foods seems to blind some people to other often more important considerations. In the advocacy of standard bread the fact that pigeons fared better on this than on white bread has been brought forward. For long years pigeon fanciers have known that old mortar, little stones and pigeon grit in addition to their grain food was good for their pigeons' health. Similarly experimentalists have shown, or think they have shown, that chickens brought up on sterilised food were liable to become weak and die, unless or until they were supplied with some dirt of a rather unsavoury description. It is not my intention to indicate that standard bread derives its virtues in similar ways, but rather to urge that we should exercise our common sense before we extol the nutritive value of any bread. As regards the teeth, the last thing that should be brought forward as a cause of the prevalence of dental caries is the lack of nutrition in bread. If there was more innutritious matter in our vegetable foodstuffs the teeth would fare much better; if the sugars were less concentrated than they are in sweets, if they were diluted with water and weak vegetable acids and incorporated with cellulose as they are in their natural state in fruits, we should hear less about the increase of caries. Man, more than any other animal, eats food which is particularly rich in nutritious matter and particularly free from innutritious matter. At the same time he has decayed teeth to an extent which makes him the ridicule of the animal kingdom. We can understand wholemeal bread being advocated because of the innutritious cellulose or for other innutritious constituents which it contains, but it is rather a whimsical argument to advocate bread for the teeth, necessarily containing a large amount of carbohydrate and proteid only of a non-detergent kind, because of its "superior nutritive qualities."

Moreover, we should remember the law of evolution, both retrospectively and prospectively, and instead of worrying

over the problem as to what single food would *per se* be the most suitable, we should rather recognise that in matters of diet there has been, and is still further bound to be, an evolution from simple, indefinitely satisfactory, single or few food diets to the varied, definitely co-ordinated and complex dietetic regime which best subserves the needs of the highly evolved and complex physiological unit, man.¹

BREAD AND FLOUR.

[These extracts of letters from Miss May Yates explain themselves. No reference to the subject would, however, be complete which did not contain some acknowledgment of the devoted labours, extending over a period of forty years, of my friend and fellow-Lancastrian, the Hon. Secretary and founder of the Bread and Food Reform League. Her contributions to the discussions at Manchester were not the least valuable and informative.—Ed.]

CEREALS AND THE TEETH.—"Communications received lead me to believe that medical men are so impressed by the experiments showing the importance of soluble fat A vitamine in preventing rickets and dental caries that they do not realise, as explained in the marked paragraph on page 20 of enclosed report, that the soluble B anti-neuritic vitamine and the phosphates in cereals are also necessary for the proper development of bones and teeth.

"As it is so important that public attention should be directed to this point, I should like, if I may, to contribute a paper on the subject to the Conference you are arranging."

EXTRACT FROM REPORT OF A MEETING AT THE HOUSE OF COMMONS, DECEMBER 11TH, 1919, TO RECEIVE A DEPUTATION FROM THE BREAD AND FOOD REFORM LEAGUE.

FAT AND RICKETS.—Miss May Yates: With reference to Dr. Elliot's valuable remarks upon the importance of fat in preventing rickets, I should like to say that, as Sir James Crichton-Browne mentioned, brown bread and butter is a

¹ See also "A Note on the Causation and Prevention of Dental Caries," Dr. J. Sim Wallace, *British Dental Journal*, April 15th, 1921.—Ed.

typical food combination. Bread made from whole wheat meal ground to the uniform fineness advocated by the League, assists the digestion of fat; whilst Professor Herter has elucidated that fats markedly facilitate and promote the absorption of lime.

The Medical Research Committee state in their Report that cereals "which have undergone some manufacturing process resulting in the loss of the embryo (the principal seat of water soluble B vitamine) are most deficient in accessory food factors. A diet, therefore, of such substances is unbalanced and most effective in producing rickets." It therefore appears that soluble fat A and water soluble B anti-neuritic vitamine are both essential for the prevention of rickets.

SALTS NEEDED FOR BONE DEVELOPMENT.—Moreover, the phosphates found in whole wheat meal are necessary for the proper development of bones. Whole wheat meal contains double the amount of lime found in white flour, whilst the soluble phosphates will form, as Dr. Rideal said, the true bone former or phosphate of lime, by combining with the lime abundantly obtained from green vegetables when taken in the form of salad, or cooked so as to retain the valuable soluble substances, usually thrown down the sink. Modern science realises the importance of the "minute quantity," and it is stated that "a very small proportion of phosphate of lime introduced into the dietary of a growing child is capable of making the difference between deformity and proper development." As the above report further states, "it is probable that a deficient calcium intake associated with deficient anti-rachitic factor intake will bring about more strongly marked bone and other deformities associated with rickets than would occur if the supply of calcium salts were adequate."

The general use of finely ground whole wheat meal will therefore assist the prevention of rickets, a disease which helped to produce a large number of the C₃ men.

Miss Yates adds: "These remarks also apply to dental caries, a form of rickets."

[She was informed that the programme of the Conference was complete, so that it was not possible to profit by her

offer, but there would be opportunities for her to make the points in the course of the discussions.—Ed.]

In a subsequent letter Miss Yates wrote: "As there is a serious attack on the value of whole wheat meal in the prevention of dental caries, I venture to ask if your committee will kindly allow me to move the enclosed urgency resolutions: "

SUGGESTED RESOLUTIONS.

"*As dental caries is due in a large measure to malnutrition,*
IT IS RESOLVED

"That the Minister of Health be asked to spread information about the essential elements of diet.

"*As nations which live mainly upon whole wheat meal have better teeth than those whose principal food is white bread,* IT IS RESOLVED

"That the Minister of Health be asked to direct attention to the public value of finely ground whole wheat meal, especially for children.

"Whole wheat meal contains about double the amount of lime found in white flour, whilst the soluble phosphates of wheat can unite with the lime found in green vegetables and other foods to form the essential phosphate of lime which, when combined with suitable fats, is readily absorbed in the intestines and provides suitable pabulum for the formation of good teeth."

[Resolutions were not permissible at the Conference, but the Executive Committee of the Food Education Society, at its meeting on July 28th, 1920, unanimously adopted one expressing its earnest hope that "early legislation would be introduced to protect flour and bread from deterioration and adulteration and to encourage the wider use of a larger proportion of the wheat berry, in the interests alike of national health and economy."

This was ordered to be sent to the Prime Minister, the Minister of Health, and the Food Controller. Similar resolutions were passed by the British Medical Association, the Society of Medical Officers of Health, etc.

Bread and flour play such a large part in the dietary of all

sections of the community, especially of wage earners, and a wise selection of flour has an intimate bearing on problems connected with the prevention of diseases of the teeth. It will, therefore, be a convenience to many readers to have at hand authoritative information on the subject. See *Facts for Patriots*, 2nd and 4th series, price 4d. each.

The appended letter from Miss Yates gives a gratifying account of the success already achieved.—Ed.]

I am glad to say much progress has been made in retaining the valuable germ of wheat in Government Regulation flour.

Reports received show that most influential roller and stone millers, with large mills in various parts of the country, are leaving the germ, without cooking it in any way, in the Government Regulation flour, instead of selling it, as previously done, to makers of fancy breads.

Bread made with this G.R. flour retaining the germ is palatable, attractive-looking bread. It has met with approval by the public, and bakers have not made any complaints about difficulties in manufacturing it.

The celebrated botanist, Professor Henslow, M.A., F.L.S., a Vice-President of the League, has kindly examined under the microscope an 80 per cent. flour containing the germ, which has been used for about thirteen years at the Blue Coat School. The authorities were so satisfied that before the war they used it exclusively, even for puddings and cakes. Professor Henslow wrote that the bran extracted from this 80 per cent. flour retained no germ. After comparing this flour with a 100 per cent. finely ground whole wheat meal, he said there was little difference between the amount of germ found in the 80 per cent. flour and that contained in the finely ground whole wheat meal.

Experiments carried out by the Lister Institute show that vitamins found in the germ have ten times the potency of those in the bran and square aleurone cells, whilst the pre-war white flour had none of these valuable substances.

You will be glad that the efforts you have so kindly assisted have secured for the people, in these hard times, a more nourishing bread than was used in pre-war days, which it is hoped will greatly benefit the health of children. You will be pleased also to hear that the Ministry of Food has written congratulating me on the success obtained by my "persistent

efforts," and saying, "May I assure you once again that the Ministry has your arguments carefully in mind."

As millers are now of their own accord leaving the germ in flour, it is hoped that when control is removed it will be easier to modify the Food Adulteration Acts, so that at any rate the germ shall not be taken from flour unless the public are notified of this abstraction.

[The following extract from the rough notes of a discussion on adenoids at The Royal Society of Medicine, January 24th, 1919, may serve as a postscript to Miss Yates's article.—Ed.]

WHERE PERFECT JAWS ABOUND.—A doctor called in to treat German prisoners stated that he was greatly impressed with the large number of perfect jaws. He was told that they petitioned for more vegetables and bread (black), instead of so much meat. He had also heard through a general that a Labour battalion in France, largely composed of German prisoners, petitioned for the same changes in food. He knew little about their diet, and was much interested in the request. He believed that Germans were also breast-fed.

THE DENTIST'S ALLY.¹

"VERY GOOD FOR DENTISTS."—"A dentist once said to me (during one of the those periods when one lies gagged and helpless in the red velvet chair), 'Do you know who was the best friend we dentists ever had?' I made an articulate noise to signify that I did not. 'He was a miller in Hungary. Lived fifty or sixty years ago. He invented a process for grinding flour so as to make bread beautifully white. The Austrians took it up. "Vienna bread" used to be advertised in England as the most luxurious bread obtainable, and people thought it was good because it was so white. Soon everyone wanted to eat white bread. Milling machinery was altered. The most nourishing part of the wheat was thrown away. Then people's teeth began to decay from childhood upward. Up to that time it had been unusual to find really bad teeth. Now it is rare to look into a mouth full of really good ones. Very good for dentists; very bad for everybody else."

¹ Extracts from an article by Hamilton Fyfe, reprinted, by permission, from *The Globe*, December 30th, 1920.

WHITE BREAD AS A LUXURY.—“When we eat white bread as an accompaniment to meat, potatoes, and other vegetables, followed by puddings or cheese, the lack of nourishment in it does not matter; we get quite enough out of the other things. When we eat a few slices of toast at breakfast after porridge and with eggs and bacon, it is of little importance whether the bread toasted is white or not. But those who have to make bread the staple of their food, who cannot afford chops and steaks, eggs and bacon, poultry and game, suffer in many ways from our foolish national preference for white flour over the flour which contains the vitalising elements. In most other countries white bread is considered a luxury, and only eaten regularly by those who can afford a full and varied diet. Hungarian and Austrian peasants live mainly on rye bread, so do Russian and German peasants. They like a slice of white bread now and then as a treat; they put it on the same level as cake or pastry, and that is perfectly sound.”

PROTECTION FOR THE PUBLIC.—“We insist upon milk being up to a certain standard, and if the sellers cannot guarantee that it contains all its natural nourishment they are obliged to put up notices to say so. We do not allow meat to be sold which is unfit to be eaten. We even regulate the strength of whisky. There is a strong argument, therefore, in favour of the law that will be proposed compelling the sellers of white bread to let the public know what they are buying. When customers ask in bakers' shops for bread they mean the staff of life. If they deliberately content themselves with loaves which will not sustain life, well and good, but at least they ought to have the choice. When so many thousands of children go to school after a breakfast of bread and margarine, when they often get the same for their dinner and the same for their tea, it is immensely important that they should have bread which really does suffice to make them vigorous and build up healthy frames.”

PORRIDGE.

[Porridge received a considerable amount of attention at Manchester—not all of it favourable. It seems desirable, therefore, to supplement the remarks on that occasion by

the extracts given below. Those seeking fuller information on the food value, digestibility, and best ways of using oatmeal and maize will find it in *Facts for Patriots*, 1st series, 4d. Barley and rye are dealt with in the 4th series, 4d.—Ed.]

“WE ARE WHAT WE EAT.”—Yesterday I had a talk¹ with Mr. Charles E. Hecht, Hon. Secretary of the Food Education Society, which last year amalgamated with the National Food Reform Association. Mr. Hecht, I soon discovered, though not a Scot, holds very decided views on the subject of porridge. This, he maintains, is deprived of half its value by being reduced to thin “mush,” which so many people now prefer. “You must get your teeth into porridge,” he said, “if it is to be any good as a food.” As an instance of the real thing he quoted the testimony of a schoolmaster who had told him that in his home in Sutherlandshire the porridge used to be made so solid that pressure was required to get a spoonful out.

The great point about porridge cooked in this way is that time must be taken to masticate it thoroughly. This is absolutely necessary for its proper digestion. Nothing, on the other hand, offers such temptation to the man or woman who habitually “bolt” their food as the thin “mush” generally presented under the name of porridge. For this reason Mr. Hecht holds that quick eaters should eat oat cake rather than porridge, because it cannot be bolted. He also suggests, for the same reason, that toast or oat cake should be eaten *with* porridge, and he points out that excess of milk will, of course, increase the sloppiness of porridge that is already too thin.

IS OATMEAL BAD FOR THE TEETH?—“At the recent meeting of the British Medical Association in Aberdeen, oatmeal was tabooed by some dental authorities. The argument was that in order to develop well teeth need to be exercised, and that as oatmeal does not require chewing, therefore as a food it is bad for the teeth. . . . The figures we have obtained flatly contradict the statement that the users of oatmeal have worse teeth than the rest of their school fellows. Unfortunately among the poorer classes of the community

¹ Reprinted, by permission, from an interview in the *Edinburgh Evening Dispatch*, September 23rd, 1920.

oatmeal and oatcakes have ceased to be articles of diet, and it is the children who have as breakfast tea and a roll, with tea at noon, and tea at night, who have the worst teeth, just as among adults it is the hardworked and underfed girl who uses tea so frequently that suffers from acid dyspepsia, which, acting on the enamel of the teeth, gives the worst cases of dental caries. Tea is certainly doing harm among our young people. Extreme cases of those tea-fed children can be picked out infallibly in the course of medical inspection. The lack of subcutaneous fat in the face, the faint lines running from the nose to the chin round the angles of the mouth, the nervous half-frightened wild-animal air of the little one tell of tea poisoning, and form a type as patent to the skilled observer as is the alcoholic. Grateful though tea is as a beverage it is being abused, and is producing disastrous effects on the physique and health of the young.”—*Extract from the 5th Annual Report of the Aberdeen School Board on Medical Inspection, 1914.*

UNPOLISHED RICE.¹

A PERFECT DIET.—We have had, during the last generation or so, to revise our standard of what constitutes a perfect diet—*i.e.*, one which contains everything essential to health. Formerly it was considered enough to look for an adequate supply of body-building and tissue-repairing material, such as is found in meat, fish, cheese, eggs, the pulses (peas, beans, lentils, and pea-nuts), fat, in one form or another, saccharine (starch and the sugars), and water. If we happened to be unusually well-informed in such matters, we also stipulated that the diet should include some of those salts which are among the most valuable attributes of fruit, vegetables, and salad. Of late years we have learnt that this is not enough. The food we eat may conform to all the above requirements and yet be deficient in one material respect.

“ACCESSORY FOOD FACTORS,” OR “VITAMINES.”—To use a word which, though “made in Germany” in 1913 by Funk, is rapidly passing from scientific into popular parlance, such a diet may be lacking in “vitamines” or “accessory food substances.” These, though present in the body in very

¹ Reprinted, by permission, from *National Health*, November, 1919.

small quantities, exert upon it an influence altogether out of proportion to their amount.

THE CASE OF RICE.—Perhaps the most striking and oft-quoted illustration is to be found in connection with rice. Many social workers are already familiar with this classic instance of the deficiency disease known as beri-beri, as found among populations in the Far East, living chiefly on this cereal, and are accustomed to sing the praises of unpolished rice. The information that follows, will however, it is hoped, be none the less acceptable.

CAUSE OF BERI-BERI.—At first the disease was attributed to bad—*i.e.*, stale or mouldy—rice. Only gradually did it come to be recognised that the disease resulted solely when the rice had been treated so that it lost an essential constituent. It is significant that the arrival in the East of modern milling machinery brought a great increase in the number of cases of beri-beri, whereas the native methods of treating the rice, which nearly always merely separated the husk, were unobjectionable. The steam mill, on the other hand, removes a very thin layer, the “silver skin,” which lies on the outer part of the seed, together with the germ or embryo.

A DOCTOR'S DISCOVERY.—In 1897 a Dutch doctor produced conclusive proof that the disease depended on the handling that the grain had received in the mill. His statistics related to some 280,000 persons who had passed through the gaols of the Dutch East Indies. In 37 prisons unpolished rice was used, in 1 alone of which cases of beri-beri developed. Of 13 prisons where both kinds of rice were used, beri-beri resulted in 6 of them. In 51 prisons where the rice was altogether polished, 36, or over 70 per cent., developed cases of the disease.

THE MORAL.—The conclusion of the matter is, ask your grocer for unpolished rice and see that you get it. If you have once tried it you will be so impressed with its superiority in cooking that there will be no likelihood of your reverting to the inferior article, except under stress of circumstances. Rice is used, relatively, to so small an extent in this country that, under normal conditions, no serious consequences will

ensue from the neglect of the above advice. At the same time "many a mickle makes a muckle," and the regular use of unpolished rice will result, not only in the provision of more nutritious, wholesome, and appetising food, but in a gain to health to adults and especially to children whose teeth and bones will testify to the superior merits of the whole or unrefined article. "Pearl," or polished barley, is open to a similar objection, and "pot" barley should always be preferred.

For full information regarding the food value, digestibility, and best ways of using both rice and barley, see *Facts for Patriots*, 4th series, post free 5d.

DOES IT MATTER ?

[Dr. Langworthy, head of the United States Nutrition Investigations, speaks with unique authority on all questions connected with food, and hence the inclusion of the appended correspondence, which took place in 1915.—Ed.]

Dr. C. F. Langworthy, Chief, Nutrition Investigations, U.S. Department of Agriculture, writes : " In your discussion of grains in ' Facts for Patriots, No. 15,' you lay great stress on the whole grain. Notwithstanding the beliefs of whole-grain enthusiasts, available evidence warrants the conclusion that, rightly used, various types of flour and other grain products are wholesome, valuable food products. One has to consider not only the flours or other grains, but the foods eaten with them. In a generously varied, mixed diet the kind of bread eaten is a matter of preference not of necessity.

"With reference to polished and unpolished rice, the conclusion drawn from extended work in the Philippines was that when the diet consisted of a few food materials and rice constituted a large part of it, the unpolished rice should be chosen. When the diet was generously varied and rice constituted a moderate part of it, the kind of rice was a matter of personal preference. It would seem that in the United States, and, so far as I can judge, in England, rice forms a comparatively small part of a reasonably varied, mixed diet, which would hardly warrant the statement that preference should always be given to the unpolished rice, which appears on p. 54 of *Facts for Patriots*."

In reply the writer remarked : " Like you, we often emphasise the relative unimportance of the kind of flour, or rice, for people who have a varied and extensive diet. Even in their case, however, you will doubtless agree, it is well they should know where the superior food value lies, if only because many of them have opportunities of passing on information to those whose diet is more restricted. Moreover, since most people lose the salts in vegetables by faulty cooking and do not eat salads to any large extent, we consider it important that they should have a chance of securing the salts¹ through the medium of the grains, or rice. The above remarks do not, in any case, apply to wage-earners, whose dietary cannot usually be described as generous or varied."

III.—MILK.

[The last of the three chief offending foodstuffs, from the point of view of the teeth, is milk, which is much abused and wasted.

The following article, under the title " Don't Drink Milk—Not a Good Thing for Adults,"² was based on an interview, and sent to press without its part author being afforded an opportunity of revising it. It was war time, there was no crisis that morning, and the editor decided to take his chance, which came a few hours before the proof was due back. Though reprinted as it stood, the M.P. is no longer at St. Stephens, and the doctor would be the first to repudiate the practice imputed to him.—Ed.]

BY CHARLES E. HECHT.

Hon. Secretary of the National Food Reform Association.

" Drink less milk ! " That is the motto to be adopted all round if the milk dealers are to be brought to a reasonable frame of mind.

In the view of Mr. Hecht, who has written much on dietary questions, there is much waste involved in the present extensive use of milk by adults.

This custom keeps the infants of the poor from getting the milk which is for the little ones their very life-blood.

¹ *A fortiori*, if vitamins, then less to the fore, be taken into account.—Ed.

² Reprinted, by permission, from the *Evening News*, June 23rd, 1916.

The most widely prevalent mistake about milk is made by the people who take it as food.

A well known M.P. confessed a little while ago that he had for a long time taken a pint and a half of milk a day, and a Scotch doctor said he also took a large quantity of milk daily. In both cases it was found, I think, that the diet resulted in a fat and flabby condition. The fact is that for adults milk is altogether too bulky as a food—that is to say, there is relatively little nutriment in it compared with the quantity of water—on an average there is 87 to 88 per cent. of water.

But for very young children milk is a perfect food—for babies, that is, who have no means of digesting the starch which is found in so many foods. And that is one reason why I contend that at this time, especially when milk is dearer than it has usually been, the use of it by adults is wasteful and in every sense uneconomical.

A POINT ABOUT PORRIDGE.—Nor is it an improvement of the case for the adult that the consumption takes the form of bread and milk. Rather, indeed, is this an aggravation of the case against the adult user of milk. It is one of the great troubles of to-day in the matter of healthy living that people have so much of their food in a soft and sloppy form, giving no opportunity for mastication.

As for porridge I know the Scotch were said to cultivate literature on a little oatmeal, but the fact does not make porridge any the more suitable for people of sedentary occupation or for brain workers in the south. It must be remembered that with the Scotch students oatmeal was the staple diet—here porridge is merely part of the meal. And the mixing of milk with it helps to prevent proper mastication, so that even when it is almost, if not quite, the only food taken, you sometimes hear people say that soon after a meal of porridge they feel as though they had not eaten anything. This really means that they have not masticated the porridge, and that, consequently, fermentation has begun. If porridge is taken it should be along with fairly hard bread or biscuit, and as dry as possible.

NO DRINKS WITH MEALS.—There should be no drink of any kind with meals. But we ought to drink a great deal more

than the average person does between meals. It is, I know, very difficult to get out of the habit of drinking at meals. In this connection I may point out that with a view to encouraging war economy in the feeding of school children the Board of Education in a pamphlet on the subject suggested that there should be no glasses placed on the tables at meal times, but that they should be available if the children wanted to drink. I remember in one case seeing the glasses on the tables. They were upside down, a sort of delicate hint that they were not intended to be used.

MILK—AN UNHYGIENIC FOOD.—While milk is specially a food for infants, for children with the full complement of teeth, it is regarded by experts on the subject as unhygienic, taken with other foods which will cause it to lodge and ferment in the crevices of the teeth, or between the teeth. "We dentists know," said a leading London dentist, "that a milk regimen is disastrous to the teeth."

A POPULAR DELUSION.—One popular delusion on the subject of milk is that it is what people call strengthening. And so you find people taking an extra glass of milk in the belief that it will do them a lot of good. They do not realise that the body can only assimilate a certain amount of food, and so we find very often what might be regarded as an amusing result, namely, that the more milk they take the thinner they get, for the same cause that makes some people fat makes other people thin—it is mal-assimilation. Milk again is clogging to the system, and in any case it is selfish on the part of adults to drink it, especially when there is not enough to go round for the little children. Skimmed milk contains a slightly larger proportion of body-building and tissue repairing material. But if given to children it must be supplemented by fat—with that it is a most valuable food, especially for children in families where special care has to be taken of the pence. Second only to salt fish in nutriment, it is very nourishing, though a one-sided article of diet.

Dried milk is especially useful for cooking, as Dr. Eric Pritchard has pointed out, but here again it is necessary to add fat in the form of suet or dripping, or vegetable suet. Buttermilk is the most digestible form of milk.

A CURIOUS DIETETIC FALLACY.—"One of the most curious dietetic fallacies of our time," writes Dr. Harry Campbell in *The Practitioner*, July, 1919, "has reference to milk. The entire [medical] profession, led by learned physiologists, has been hypnotised into the belief that the child needs milk after the period of lactation. A little clear thinking will show the fallacy of this. The mother's milk is the natural food for the babe, and if the mother cannot provide the necessary supply, milk from some other mammal must be substituted if it is to survive; but after the normal lactation period, say, at the end of the ninth or tenth month, the child does not *need* the milk of any other mammals. A dog or rat or rabbit does not need the milk of another species after it is weaned. Why, then, should the child?"

"GLORIOUSLY HEALTHY CHILDREN."—"An obsession as to the need of large quantities of milk," said Dr. Harold Waller, April 15th, 1921, "appeared to swamp the infant welfare centres. Milk was an ideal food for the sick child, but an enormous amount of rules had swept over from the sick room to the centre without being questioned on the way. Not more than half a pint of milk a day is advisable if the child is to thrive. An arbitrary period of nine months as a fixed point for a change of diet is not wise or practical, as the period at which a child reaches a certain stage of growth is variable. On questioning the parents of fine, healthy babies I find that they usually discovered how best to feed them by the method of trial and error until they found what the child could take. Sometimes the babies thrived excellently on a most varied diet below the age of nine months. I am not at all afraid of feeding a massive child of five months on eggs and suet. Cow's milk played no part among the poor in the feeding of infants, who were often gloriously healthy, and inasmuch as they lived in cellars and had but little fresh air, their well-being could only be attributed to their diet, which often resembled that of their parents. During the war the Government expressed horror that no milk was available for the poor. The poor did not, however, use it, and there was no reason why they should. Bread fried in fat, dripping, and suet puddings supply all the fat necessary."

A MEDICAL OPINION.—"Although happily," said Dr. Harold Waller, at the Conference of Educational Associations, January, 1921, "less lethal than formerly, milk is rather medicine for delicate children than food for normal ones after about fourteen months of life, during which breast-milk is the baby's natural right."

"GOOD OLD MOSES."—"Medicine rested," said Sir James Cantlie, K.B.E., February 13th, 1921, "on the laws of Moses. All that the scientists of to-day, with their microscopes and text-books, did was to prove the ancient lawgiver was right. . . . Our wrong use of milk was the cause of indigestion and bad teeth. Moses laid down the salutary law that milk should not be drunk until at least two hours after eating fish, three after chicken, and four after meat, but we disregarded this and gave milk at meals. No careful Jewish mother would give milk to her child when meat was served."

[Those desirous of obtaining authoritative information regarding the food value of milk for children and adults, its digestibility, the merits of raw versus boiled, of dried, and certified milk, with a survey of the conditions under which milk is supplied, constituting a national peril, are referred to *Facts for Patriots*, 3rd series, 4d.—Ed.]

COOKERY AND VITAMINES.¹

MERITS OF SLOW COOKING.—A correspondent writes: "Can you give me your latest information with regard to vitamins? I have systematically used the 'fireless cooker' for some years now, with great advantage as regards gas bill and improved flavour of food. The new doctrine of vitamins, however, seems to condemn slow cooking. Fast cooked vegetables seem to me to *lose* much of their value. Is the benefit of retaining salts or flavour more than counter-balanced by the loss of vitamins? I should be very glad of some practical advice."

ITS EFFECT ON VITAMINES.—Miss Petty answering this inquiry said: "All cooking destroys vitamins² to a certain

¹ Reprinted by permission from *National Health*, April, 1921.

² The Germans during the war discovered that sunflowers contained vitamins and gave orders for their extensive cultivation. They used them, however, for making margarine, and in the process of cooking the vitamins were destroyed by heat!—Ed.

extent. Fireless cookery is reckoned to take away a little more, but the saving of salts, flavour, fuel and worry more than makes up for this. The essential thing is to see that vitamins are included in the diet. They can be had in the form of uncooked vegetables (greens and salad, fruit and bread). Warmed-up food is open to the objection that it has lost its vitamins, as is condensed milk."

[Side by side with the opinion of "The Pudding Lady" may be placed that of Dr. Leonard Williams, from whose article in the *Evening News*, July 19th, 1920, the following extracts are, by permission, taken :—Ed.]

AN ENEMY TO HEALTH.—One of the greatest enemies of healthy living is the cooking stove. The probability is that cooking is more deadly to some vitamins than to certain others. This is to be conjectured from the fact that hundreds of people who never eat raw foods at all nevertheless manage to survive and do useful, vigorous work. Vitamins reside in raw foods in the same way that vitality resides in live people and living things. If you eat a raw apple, you eat something which is alive, and you get the benefit of the vitality which it contains.

MESSAGE OF MODERN DIETETICS.—The message which modern dietetics has for those who are wise enough to hearken is that the present fashion of cooking all our foods is a very serious mistake. At this time of year especially nature provides us with large quantities of fruits and of vegetables which can be eaten as salads, and these are the things for which a taste should be carefully cultivated, especially amongst the young. If you take a sufficiency of vitamine-containing foods there is not much room for those which contain no vitamins.

OUT OF THE FRYING PAN INTO THE FIRE.—The most important side of this question refers to children. For at least two generations we have been feeding our children upon pappy foods which require no mastication, and from which all the vitamins have been extracted by boiling.

We have boiled our foods against the microbe, when we ought to have realised that vitamins are far more important

¹ Civilisation has given man cookery and with it dental decay ; he must see to it that he gets some hard and some raw foods.—Professor Irving Fisher, President, American Committee of One Hundred on National Health.—Ed.

than microbes. So we have fed our children upon devitalised foods which require no mastication, with the inevitable result of adenoids, tonsils, and appendicitis, and such a degree of dental deterioration as to necessitate dental clinics amongst school children.

WHY TEETH DECAY.—The teeth deteriorate because they are not used; they become crowded because the jaw is not developed. The way to get rid of dental troubles in the young is to treat the children as we treat puppy-dogs, by giving them something which they must chew, and make them in fact work for their living.

If vitamine-containing, that is, raw foods are given in sufficient abundance there will be little trouble with the modern diseases above mentioned, and none with dental disease.

A list of the principal foods containing the three ascertained vitamins or "accessory food factors" will be found on pp. 209-210.

NASAL HYGIENE.¹

[The relations between oral and nasal hygiene are so intimate that no justification seems required for giving a place to this summary of Dr. Octavia Lewin's helpful and suggestive address.—Ed.]

THE NOSE AND ITS FUNCTIONS.—Oral hygiene, which figured so prominently in last month's *National Health*, may fail in its objects if nasal hygiene is not also fully practised. No apology, therefore, seems needed for dealing now with the latter subject, apropos of a lecture, as stimulating as it was interesting, given by Dr. Octavia Lewin. The mouth, she insisted, was only intended to deal with food, and was quite incapable of dealing satisfactorily with air. This function was reserved for the nose, described as a highly complex structure occupying a relatively large part of the head, and consisting of a series of air-containing cavities. Here the air was tested, warmed, filtered and purified. Other functions of the nose, which was lined throughout, were to draw away tears, and any accumulation of moisture, to drain the base of the brain, while smell, taste, sight and hearing were largely

¹ Reprinted by permission from *National Health*, May, 1919.

dependent upon it. It also played an important part in voice production, mentality and expression of face. In this connection, a remarkable series of photographs of a boy who could not sneeze, showing his gradual awakening intelligence, was exhibited.

OBSTRUCTION AND MOUTH BREATHING.—To the blocked nose the lecturer attributed the origin of thousands of instances of running ears, while in the case of decaying teeth, she showed how the matter might work out as pus, through the nose down the throat, with disastrous results to health. She suggested that nasal obstruction was probably one of the most important factors in consumption and emphasised the danger of any discharge being left in the nose, the brain being just above it. Mouth-breathers often suffered from sore throats, laryngitis, etc., as also from digestive troubles. Enquiring why mouth-breathing was rarely found in primitive folk, she attributed it to their realising that their efficiency depended upon special senses, which in turn depended largely upon the nose. Could we not have at least as high an ideal as the uncivilised mother, who never let a child sleep with its nose obstructed?

A GOOD WORD FOR SNEEZING.—Criticising the popular objection to sneezing, which is the method of nature, on the score that it involves the scattering of germs, she contended that this did not afford an excuse for bottling them up in the nose, a typical incubator. Sniffing was to be deprecated and sneezing encouraged. Handkerchiefs should be kept within easy reach, moderation observed in blowing the nose, and tight and excessive clothing be avoided. Breathing exercises where the nose was stopped up were characterised as dangerous. The lecturer described the keen interest displayed by the children attending her weekly class at the offices of the Westminster Health Society, where this address was given.

ADENOIDS—A CAUTION.—Regarding adenoids, of which Sir William Osler had said there were more to the acre in England than anywhere else, she deprecated operations pending a trial of natural methods.

The Chairman (Dr. Mary E. Phillips) suggested that an appalling number of children derived no benefit from such an

operation through not having been taught how to use their noses. She spoke with enthusiasm of a visit to Dr. Lewin's clinic, and described how her patients had gained in health and intelligence through the practice of her methods.

ANTENATAL DIETETICS.¹

LACTATION.—May I outline certain considerations and indications for further research which seem to arise from the recent work on "vitamines," as set forth in the invaluable new document published by the Medical Research Committee as special report No. 38 ? It would appear that the "growth" of "antirachitic" factor is furnished to the milk of mammalian mothers in their diet, if at all ; and in its absence therefrom rickets will ensue even in breast-fed infants, as notably in those of the wrongly fed negroes of the Columbus Hill district of New York (*loc. cit.*, p. 88). If the breast-fed infant is to thrive, the breast itself must be properly fed.

THE GROWTH FACTOR IN GESTATION.—So much for lactation ; but what of gestation ? We cannot doubt that the growth factor is as necessary for embryo and fœtus as for the infant. This assurance is corroborated by the observation that in fishes the growth factor is found in the roe, and that in birds it is found in the eggs. The developing organism, piscine or avian, is endowed and provided with this essential from the first. As for insects, we must study, in respect of vitamins, the two contrasted diets, one of which produces a "worker" or sterile female bee, and the other a fertile "queen." We may expect to find a vitamine factor of gametogenesis. The mammalian embryo, however, must depend, in this newly discovered particular, as in all other, upon the maternal blood—at least after the very earliest stages of segmentation. Surely these considerations open a new chapter in what we may call, according as whether we look at the present or the future generation, either the dietetics of gestation or antenatal dietetics.

DENTAL CARIES IN PREGNANCY.—Two well-known facts, hitherto obscure in causation, would seem now to be capable of explanation, if we proceed to experiment on the lines which it is the purpose of this communication to suggest.

¹ A letter, reprinted, by permission, from the *Lancet*, January 3rd, 1920.—Ed.

The less important of these two facts is the dental caries so common in pregnancy. The work of Mrs. Mellanby on the development of the dental enamel in puppies' teeth,¹ according to the supply of the growth factor in their diet, suggests that the dental caries of pregnancy may be associated with the demands of the fœtus upon the growth factor which it requires from the maternal blood. Evidently the production of enamel and the protection of enamel are not the same process; but if the growth factor be the anti-rachitic factor, if it be protective in function, defect of it may cause defective production of enamel in the one case and defective protection of already formed enamel in the other. We know that thyroid deficiency produces different results in the developing and in the fully developed organism respectively. Further, defect of the growth factor in experimental rats and in children may cause xerophthalmia, due to lessened resistance to bacterial action; and the case of dental caries may be analogous. Should we not now make very exact and statistical observation, *in re* vitamine content, upon the dietaries of those pregnant women who respectively do and do not suffer from the acute dental caries of gestation?

ALCOHOLISM A CAUSE OF STILL-BIRTHS.—The more important of the two facts which now seem nearer elucidation is the large proportion of hitherto inexplicable still-births. We have lately learnt how many still-births are due to syphilis. In view especially of the experimental work of Stockard and Papanicolaou on guinea-pigs (work which I lately had the advantage of studying in detail at first hand in New York) I suspect maternal alcoholism of frequently causing still-births in our species as in the experimentally alcoholised guinea-pig.² Sir R. Welsh Branthwaite, in many official reports, has given the reproductive history of chronic inebriate women in reformatories, showing a proportion of still-births, with tendency thereto *increasing* in successive years, unlike the sequence of syphilis. Dr. W. C. Sullivan, in a paper prepared for the

¹ The *Lancet*, December 7th, 1918.

² For summary of this work see *Alcohol: Its Action on the Human Organism*, Report of Committee appointed by the Central Control Board (Liquor Traffic), H.M. Stationery Office, Kingsway; and for greater detail, the new edition, now in the press, of Horsley and Sturge's *Alcohol and the Human Body*, Macmillan.

National Birthrate Commission, has noted the same increasing tendency to still-births in inebriate women. But, even if and when we make due allowance for this factor, there will remain a quite extraordinary proportion of unexplained still-births—32·6 per cent. in the well-known American series, and at least 25 per cent. according to Dr. Amand Routh in evidence recently given before the National Birthrate Commission (the possible influence of alcohol not having been considered in either estimate). May not some at least of these deaths be due to antenatal “rickets” or deficiency disease consequent upon defective feeding of the mother?

Surely these questions can and should be answered, clinically, pathologically by further microscopic study of dead-born foetuses, and experimentally. But, even already one notable contra-indication for practice in the dietetics of gestation may be defined. Stout and porter, so long commended for motherhood, are signally condemned, first, as we knew, because they contain the toxic ingredient, alcohol; and, second, as we did not know, because they do not contain the essential vitamins. Malt and yeast are rich in these factors, but the process of brewing totally destroys them, beer, as we brew it, being thus the most common and nationally important example of a preserved, stale, artificial, devitalised because vitamine-deprived “food.” Whether the alcohol or the high temperature involved in brewing destroys the vitamins—or dietary ferments, or trophozymes, as should we not call them?—is a subsidiary but not unimportant question.

CONCLUSION.—The conclusion is that we must make further experiment upon the dietary of gravid mammals. In 1906 I introduced the term “racial poison,” now in general use, for such agents as lead and alcohol, which produce the germ-cell poisoning, or “blastophthoria” of Forel, or intoxicate the embryo or foetus when ingested by the pregnant woman or other mammal. But it would now appear that we have to reckon with antenatal deficiency disease as well as with germinal or antenatal intoxication. My friend and teacher, Dr. J. W. Ballantyne, discussing the pathological condition of certain foetuses, wrote as follows in 1902: “At the present time the cause of the dystrophy which has been described above is unknown. It may be guessed that the conditions

which produce rickets in post-natal life are active in a modified form or in a different degree here.”¹ I shall be honoured if he is able to attach any importance to my present suggestions for testing his views ; and perhaps to amplify his pages on diet in his volume on *Expectant Motherhood*, published as recently as 1914.

The recent experience of the Zoological Gardens in respect of pregnant animals under war restrictions of food may furnish some data worthy of correlation with future researches by the Antenatal Investigation Committee of the Medical Research Committee and elsewhere on the lines here suggested ; and the dietetics of expectant motherhood, hitherto exploited mainly by superstitions about beer and by quackery about the determination of sex, may attain a new and effective importance in the genesis of a healthy race.

C. W. SALEEBY, M.D., F.Z.S., F.R.S.E.

Royal Institution, W.,

December 20th, 1919.

Addendum, December 30th.—May I add two notes ? (1) At our own Zoological Gardens the view is suggested that the Polar bears, Sam and Barbara, failed to breed during the war, though they always bred before and have done so again this year, because of the deficiency of fat (? of “fat soluble A”) in their diet. (2) A Scottish correspondent tells me how its mother feeds the King Penguin chicken, the first ever raised in captivity, at the gardens of the Scottish Zoological Society : “The mother penguin lives entirely on fish and feeds its offspring by the regurgitation of the digested fish, and its transference from her own beak to the beak and down the throat of the chicken. The interesting point is that, up to the hatching of the egg, the mother accepted any kind of fish as food, but since she has had to feed her chicken she declines all fish except *herrings*. You will remember that herrings are specially rich in ‘fat-soluble A.’ Query : Does the mother penguin know more about vitamins than the human mother ?” This query raises the profound question of the hazardous supersession of ready-made finite animal instinct by ignorant, teachable, infinite human intelligence ; but the fact of natural history here recorded is fascinating.

¹ *Antenatal Pathology and Hygiene*, vol. ii, p. 346.

DEVELOPMENT OF THE TEETH: CERTAIN PHYSIOLOGICAL CONSIDERATIONS.¹

By ERIC PRITCHARD, M.A., M.D.

FOUNDATION OF THE TEETH.—The care of the teeth comes within the province of the physician—at least, of the modern prophylactic physician—long before the dentist appears upon the scheme; indeed the history of dental caries dates from a time long antecedent to the period at which the decay can be detected by the most experienced eye.

Whether teeth decay or perish depends on the manner in which the original foundations are laid during childhood, early infancy and even before birth. It is only teeth which are built of good material, which are properly organised and knit together, that can resist the disintegrative forces to which they are normally exposed in the everyday wear and tear of life.

BONES AND TEETH—A PARALLEL.—The steps in the development of teeth run a parallel course with those of the development of bone, the history of the one is the history of the other. The rickety child with soft bones possesses also friable teeth.

Why does the rickety child have soft bones? This is the matter on which authorities differ. For my part, I have no shadow of doubt that the reason is that the calcium and other metallic bases which should be incorporated in their structure, in the same way that steel wire reinforces and strengthens ferro-concrete, are required in the rickety child for even more urgent physiological purposes—namely, for the saving of the child's life from certain immediate dangers which threaten it.

THE COST OF FIGHTING ACIDOSIS.—All the causes which are responsible for the rickety condition tend to produce a condition of acidosis, which, if it becomes of high degree, is incompatible with the continuance of life. All the resources of the body combine to prevent or mitigate this danger. The means by which acidosis, or the existence of acids in the blood, is mainly prevented is by the immediate neutralisation of free acids by the sacrifice of available mineral bases such as calcium, ammonium, iron, magnesium, sodium, potassium,

¹ Reprinted, by permission, from *National Health*, April, 1919.

etc. As the result of this necessary neutralisation a large quantity of neutral salts is formed and these salts are excreted not only in the urine, but also in the fæces. One of the most constant and characteristic features of rickets is the depletion of the body of calcium. Consequently there is not enough calcium to fulfil all the physiological needs of the body and the less urgent ones suffer most and first. The reinforcement of bones with calcium and other metallic bases is not, in the growing child, an urgent necessity from the point of view of present needs, however important it may be from the point of view of prospective requirements, and hence both bones and teeth are sacrificed for the common weal, a sacrifice from which the teeth, at least, never recover.

This, briefly stated, is in my opinion the essential pathology of rickets and soft teeth. It only remains to show how all the recognised causes of rickets are also factors in the production of a condition of acidosis.

CHIEF CAUSES OF RICKETS.—Under normal conditions of health, all food elements—proteins, carbohydrates, and fats—are oxidised to the final end products—urea, ammonia, water and carbonic acid—and as such can be eliminated from the body without loss of basic carriers. On the other hand, when they are only partially oxidised, the resulting products are acids of large molecular size such as lactic, butyric, oxalic, propionic, uric and many other acids of the fatty acid series. These must be neutralised by metallic bases, and rendered inert and capable of being eliminated from the body in the urine and fæces in the form of neutral salts. In so doing the body is deprived of a number of valuable bases which should be used for other purposes, and, among them, for the mineralisation of bones and teeth.

The common causes of rickets are over-feeding, an ill-balanced dietary, under-exercising, want of oxygen, and the existence of catarrhal, tuberculous, syphilitic and other infections, as well as all conditions of mal-hygiene which depress the nervous system and thus indirectly interfere with exercise and the demands for food. All these factors cause acidosis, either directly or indirectly, by interfering with the complete oxidation or burning up of food products.

WHY MASTICATION IS ESSENTIAL.—A further point that we

have to remember is that no matter how good may be other conditions or how plentiful the building material, there will be no satisfactory development of bones, teeth, or other organs unless there is a demand for the display of their specific functions. The function of teeth is to masticate; unless teeth are exercised in this function during the period of development there will be corresponding want of functional capacity—*i.e.*, strength and hardness.

From the point of view of caries, importance is attached to the condition of the mouth; whether for instance, it is kept in a septic or aseptic state, or whether the saliva is capable of maintaining an alkaline reaction, and so forth. Important as these matters undoubtedly are, it must be borne in mind that it is only when the enamel has been chipped off that the less-resistant dentine can be effectively attacked by such weak acids as are liable to exist in the mouth, or by septic organisms: and further the enamel is not readily destroyed if it is originally made of good material. No hygienic ritual, no toothbrush, no surgical drill or dietetic regimen can compensate for developmental faults and want of mineralisation of the organic bases of teeth, whereas if teeth are well made in the first instance, they will withstand most serious abuses, as is well known to all.

HOW SOFT TEETH COME.—I should find it difficult to classify in order of importance and frequency the various factors which dispose to soft teeth, but I venture to submit that if such a classification could be made it would be the classification of the factors which predispose to acidosis—that is to say, over-feeding—want of physical exercise, rheumatism, catarrhs, and other infections as well as diabetes, glycosuria, and gout, and all those other elements of faulty hygiene which dispose to one or other of these conditions or to depression of the oxidation and metabolic processes in the growing child.

FAT SOLUBLE A.—According to modern theory rickets and soft teeth are due to an insufficient supply of a vitamine which exists in varying proportions in animal fats, and notably in cod-liver oil: according to this theory we can provide the whole nation with good teeth at the cost of a given number of gallons of cod-liver oil. May this theory prove to be true!

SUMMARY.—Briefly stated, it may be claimed that rickets—and this includes soft teeth—is due to the production of an acidosis: the acidosis itself may be due to any condition which interferes with the complete utilisation or oxidation of food elements, such as want of exercise, want of oxygen, infective diseases, excess of food. To ensure the sound development of teeth, the claims of the teeth for mineral matter must be supplied, complete oxidation of food material must be ensured, and the jaws must be exercised in their specific functions.

THE CARE OF CHILDREN'S TEETH.¹

BY FLORENCE PETTY, "THE PUDDING LADY."

GOOD TEETH AS AN ASSET.—When every mother realises what an asset a mouthful of good teeth is, the country will have no fear but that all its citizens will belong to Class A1. The nation will be a prosperous one, and the attendant evils of bad teeth—nerves, indigestion, constipation, etc.—will have faded into the dim and distant past.

At a conference recently organised in Manchester by the Food Education Society, on "The Prevention of Diseases of the Teeth," it was shown that they are practically the commonest diseases we have to fight against, and that they are greatly on the increase in our country.

SOFT FOODS.—One of the chief causes of this is the soft kind of food we eat. We have got into the way of hurrying and scrambling over everything—even our meals—and as soft foods take less time to eat than hard or tough foods, these quickly eaten foods form the largest part of our diet.

To begin with, the solid (save the mark!) food given to babies when their teeth appear, consists of bread and milk, potatoes well covered with gravy, soups, etc., every one of which can be swallowed with scarcely even turning it over in the mouth.

EXERCISING THE MUSCLES.—Now it should be borne in mind that to get good teeth, it is necessary to exercise the jaw muscles and teeth. This exercise is most important, as it

¹ Reprinted, by permission, from *Home News* (Mems. for Mothers), October, 1920.

develops these muscles and the bones, allowing for the proper spacing of the teeth, and producing good arches. "It rocks the teeth in their sockets, and increases the flow of blood and lymph through the same, tending to the nourishment and proper growth of alveolar arches," according to Dr. Harry Campbell.

While the chewing is progressing, the food gets well mixed with saliva, and this saliva, in addition to assisting in the digesting of food, helps considerably to wash away certain particles of food that, in time, cause the teeth to decay.

SOMETHING HARD A NECESSITY.—There ought always to be a certain amount of chewable foods in the diet after the teeth are through. If a meal consists of soft food, it must always be finished off with something hard or tough, called a cleansing food—such as toast, stale bread cut in thin slices and baked, or pulled bread. From a year and onwards other cleansing foods may be given, such as raw fruits (especially apples), salads and raw vegetables, etc. These could be grated to avoid swallowing lumps.

Drinks, such as water, tea, coffee, etc., are also cleansing. Of course, for young children, only the first-mentioned should be used, and it is most essential to see that it is drunk at the end of the meal and in between meals, and not as many do—a mouthful of food and water taken at the same time.

TOO MANY SWEETS.—The promiscuous eating of sweets is another cause of bad teeth. Sweets are not necessarily bad in themselves, but they are so often eaten between meals, and the last thing at night.

Take the eating between meals of sweets, and sometimes other foods such as biscuits, milk, etc., and what do we find? The chief result is that indigestion in various forms occurs; too much acid is developed in the stomach, and the stomach itself never gets the rest that is needed. All through Nature we find that rest is essential, and that as much, if not more so, by the human body as by anything else. This all reacts on the teeth.

DESTROYING THE ENAMEL.—Sweets and soft foods are more difficult to clear away from round the teeth and between the teeth. The sugar and starch in these foods turn to acid in

time, and this acid has the power of dissolving the hard enamel of the teeth. Once the hard enamel is pierced in this way, decay soon sets in, and there is nothing a germ of any kind enjoys so much as a little hole in a tooth. It makes a lovely bed for it, full as it always is of moisture, and of just the temperature in which it flourishes.

A child with a good sound set of teeth is never so liable to diseases as the child with bad teeth. Look after the first teeth as well as the second, as it is very important to keep the former teeth as long as possible. The second teeth will then come in better.

This problem of the teeth is not just a modern crank, as some would think. Every mother can see for herself how this disease is spreading, and those who have to do with the increase of other diseases know how many of them are the direct or indirect result of bad teeth.

DENTAL SURGERY : A PROFESSION FOR WOMEN.¹

By S. C. M.

A PROFESSION FOR WOMEN.

WORLD SHORTAGE OF DENTISTS.—A well-known dental surgeon recently stated that there is a shortage of dentists all over the world “and women,” he continued, “should seize the opportunity and enter the profession in greater numbers than they are doing at present.”

There are two main reasons why women hesitate before taking this step. The first is their fear of undertaking a long and rather expensive training, only to meet failure in the profession. The second is the difficulty of supporting themselves through the years at the hospital. Now the danger of failure was more real in the past than it is at the moment, and it will be still less in the near future.

OPENINGS FOR WOMEN.—Already there is evidence that there are opportunities for a woman to start private practice in dental surgery in many of our principal cities and towns, particularly if she specialise in children or in women and

¹ Reprinted, by permission, from the *Manchester Guardian*, December 13th, 1920.

children. But should she prefer the greater certainty of a salaried post to the risks and anxieties of private practice, then she will find many such openings awaiting her directly she has taken her diploma. More than one Education Committee have appointed fully qualified women as whole-time dentists to their schools at a salary of £300 to £400¹ a year. Others in smaller areas are employing them for half-time. And it is only a question of time before adult clinics will be formed to carry on the work begun among children. Indeed, such clinics have even now been started in provincial towns. Again, some of the better factories have already provided dental clinics for their employees, a plan which is likely to be extended to the workers in large warehouses and offices—just as the Americans organised such clinics over here for the numerous typists and clerks employed by their various departments during the war.

THE NECESSARY QUALIFICATIONS.—All these developments will naturally result in many salaried appointments, a large percentage of which will be open to women who are registered dental surgeons.

COURSE OF STUDIES.—To attain this desirable status the student, having passed the professional preliminary examination (which includes Euclid and algebra, and one foreign language), must go through the full course of study and pass certain prescribed examinations. This will at least take her four years, the first two being devoted to the study and practice of chemistry and physics, dental mechanics and dental metallurgy.

HOW TO SAVE EXPENSE.—Fortunately these subjects may be acquired as a pupil to a registered dental surgeon, which will save an appreciable amount of expense, particularly if she can live at home meanwhile. But, where possible, it is perhaps better to enter one of the big dental hospitals or medical schools, at which both the training and experience are invaluable. The preliminary science examination will have to be passed before the two years are over, together with the first professional examination in dental mechanics and metallurgy. The next two years are spent as a dental student at some

¹ The figures quoted are lower than those ruling to-day.—Ed.

recognised hospital, where her education in dental surgery will be coupled with general surgery and physiology and will prepare her for her final professional examination, after which she is qualified for her L.D.S. and is ready for her career.

Three years of preparation, with their consequent expense, have unfortunately kept many a clever and capable woman out of the profession.¹ But if the first two years are spent with a registered dental surgeon, these may cost her less than £50. The hospital fees for the two years will amount to 45 guineas, and these fees, in addition to such incidental expenses as books and examination fees and the cost of "board and lodging" (if not living at home), do make the years of preparation a serious matter.

SCHOLARSHIPS.—On the other hand, a fair number of scholarships are open to the student at each stage of her career, while more than one society² is ready to make loans to women while training for a profession. But no woman should be satisfied until she has taken this full diploma. For in these days her qualifications must be high if she is to compete successfully in any profession to which her sex has but recently been admitted.

WHAT CANADA AND NEW ZEALAND ARE DOING.

[Apart from the pioneer work of Dr. Truby King and the Plunkett nurses and the action that is being taken under the bequest described on pp. 123-124, it will be seen that the Government of New Zealand has inaugurated a vigorous and

¹ At a meeting of the Students' Careers Association, attended by many headmistresses and parents, various professions for High School girls were discussed. Mrs. Handley-Read, L.R.C.P., L.D.S., spoke of dentistry. The course was long, and a good general education and good health were necessary. If a girl had an eye trouble that could not be corrected by glasses, any tendency to tuberculosis or varicose veins, she ought not to take up dentistry. The dentist did his or her work standing all day in a cramped and trying position. It was better to start study on leaving school or college, as once past 25 it was difficult to concentrate on examinations. There were several bursaries available, and women were now admitted to almost all the dental schools. *British Dental Journal*, December 15th, 1919.—Ed.

² E.g., Central Bureau for the Employment of Women, 5, Princes Street, Cavendish Square, W.1, and Women's Service Employment Bureau, 58, Victoria Street, S.W.1.—Ed.

promising campaign. A detailed and stimulating account of the views of its leader, Dr. E. H. Wilkins, will be found on pages 28-37. Canada is also moving in the matter.—Ed.]

New Zealand Education Dept.,
Wellington.

July 23rd, 1920.

I have noticed with great interest the activities of the Food Education Society and the work which it is undertaking. I would like much to keep in touch with this organisation and to receive pamphlets and publications issued by it from time to time (the leaflet *Aids to Fitness*, for instance).

The Administrative Dental Officer of this Department and myself are endeavouring to institute an active and progressive scheme of propaganda, in order to educate the public of New Zealand in the prevention of disease and the deliberate cultivation of health in children. We will be pleased to send you word of the progress of our work.

E. H. WILKINS, *Administrative Medical Officer*.

STATE DENTISTRY IN NEW ZEALAND.¹

Dr. Sim Wallace tells me that you reprinted, I think, in your October number, a paper of mine on "Public Health and State Dentistry." It may interest you to know that we in New Zealand are moving rapidly in the direction indicated.

Dr. Truby King has been appointed to organise a "Child Welfare Department" of the State. He will take charge of the propaganda work. I have been appointed to supervise a training-school for dental nurses. These nurses will be attached, after two years' intensive training, to infant schools; to treat, fill, extract, etc., deciduous teeth and do general preventive work up to six years of age. Dental "bursars" are being trained at the Otago Dental School to carry on the work on the older children of the public schools. Thus in a very short time we shall have in New Zealand a well-organised system of prevention and treatment, which should be watched with interest by those who have at heart the welfare of the coming generations.

RICHMOND DUNN.

¹ A letter reprinted, by permission, from *The Dental Record*, February, 1921.

CANADA.

The Editor of the *Dominion Dental Journal of Canada*, in the Autumn of 1919, writes :

"We would be glad to receive any literature that you may have relating to the organisation, constitution and proceedings of your society. In Canada we are aiming to do some work along the lines which the name of your society would seem to indicate."

[The appended statement in *The Manchester Guardian*, October 3rd, 1919, may stand to the foregoing in the relation of cause and effect.—Ed.]

A DENTAL SURVEY.

The Ontario Government has appointed a staff of nurses, doctors and dentists to conduct a dental survey of all the school children of the province. The survey, which it is expected will take between one or two years to complete, is intended to teach children to take care of their teeth and also to ensure that all school children whose teeth are defective shall have them attended to.

A NOTABLE BEQUEST.¹

"A Friend," writes a dental correspondent who practised for many years in New Zealand, and was a former pupil of Dr. Sim Wallace, "made me the executor of his will, in which he left his little estate to be expended in teaching parents and children how to prevent dental decay. My friend was killed in action in France. In the course of fulfilling my trust (the McGoverne) I propose asking the New Zealand Government to put up notices in schools, post-offices, etc. Dr. Sim Wallace kindly assisted me in drafting them. I would be very grateful if your Society would consider them and make any suggested alterations or additions. I should then like to print them as being approved of by your Society."

A visit to the office furnished further interesting details and disclosed the origin of the bequest. My visitor used to talk a great deal to his friend of the bad condition of the teeth

¹ Reprinted, by permission, from *National Health*, May, 1920.

as the cause of much disease which was preventable. He thought that faulty diet was responsible for four-fifths of dental decay. His friend's enthusiasm was aroused, and he left all his savings to be used for this purpose.

Private E. G. McGoverne, who worked on a survey and afterwards in a Government sawmill, lived the simple life commended by Thoreau in a little hut in the bush. On his annual holiday he always had his teeth attended to.

In a subsequent letter his executor writes :—" It is splendid to know that your Society is doing so much to educate parents, school-teachers, and children as to how to prevent decay. It is most gratifying to find that you are really making progress with heads of schools and their pupils. I am encouraged to hope for similar good results in New Zealand. My own two children, aged eight and nine, have perfect teeth. They have never been given sweets or biscuits, and are very indifferent to them. It is a mistake to think that the craving children have for sweets is natural." (This contention has long been stressed by the Society, which has pointed out that only a few generations ago sugar could not be obtained except in an apothecary's shop. Children long for fruit, fresh and dried, honey, etc.)

(C) CHIEFLY ABOUT METHODS

HYGIENE IN EAST AND WEST.

[Not the least of the many lessons which the West has to learn from the East is the practice of mouth hygiene. It is not too much to say that we have here the master key to the solution of the tremendous problem with which we as a people are faced. Not only the East, but so-called uncivilised races, have, however, much to teach us in these matters. Information on hygiene in many of its aspects will be found in *Our Children's Health at Home and at School*, 5s., and *Rearing an Imperial Race*, 8s. 6d.—Ed.]

" HIS TEETH MUST BE WHITE."—" As the representative of that wonderful country, Japan, told us at Stockholm," said J. Howard Mummary, C.B.E., L.D.S., President, in his

inaugural address at the Sixth International Dental Congress, 1914, "hygiene of the mouth and teeth is perhaps older in Japan than in any other civilised country. This has its foundation less in the recognition of the importance of mouth-hygiene for the body than in old-standing religious ideas and obligations, which have gained such a firm hold of the sentiment of the whole people that no one needs to be compelled by special admonition to practise a certain amount of mouth-hygiene. Every family without exception has its home-altar, usually two, one Shinto and one Buddhist. When the Japanese rises in the morning, his first act is to rinse his mouth and clean his teeth automatically with his forefinger and salt. His second act is to go before the altar and say his prayers, for he may not utter a prayer to his god without a clean mouth. An old Japanese proverb says:— 'Let the man be brown, but his teeth must be white.' Would that cleanliness of the mouth were a religious obligation in our own lands."

METHODS OF EATING.—"Our methods of eating food," remarked Professor H. P. Pickerill, M.D., M.D.S., L.D.S., Otago, on the same occasion, "contrast with those of immune races. Nearly all natives eat twice a day only; at both times—early morning and late evening—they are hungry, they are happy, they are not hurried. We eat more or less hurriedly, four and perhaps five times a day. We are never properly hungry. We are continually worried as to the next thing to be done and we eat things both very hot and very cold—a thing which no native will willingly do. As regards cleanliness, all native races observe great care in this respect in the preparation and cooking of food. I am not sure that a native eating with his fingers from a leaf is introducing any more organisms into his mouth than we do frequently in eating from a plate with a fork and spoon, which seldom, if ever, have been sterilised since being used previously."

TEMPERATURE OF FOOD.—"The trouble begins in infancy," said Sir James Cantlie, K.B.E., March 2nd, 1921, "when children are given food too hot for them. We have trained ourselves to drink hot food. Our normal temperature is 98·4°, but we can sip tea from a cup with a spoon at 140°; we can sip it from the cup at 130°, we can drink freely at 120°, and

at 115° we say the tea is cold. The normal temperature of an infant is 98·4, but when milk is heated for it it is usually 20° ahead of what its gums can stand. The child's mouth is kept in a constant state of irritation, and the blood, which ought to be nourishing its teeth, is drawn away from them. When the teeth come through, they have their tissues marred."

INSTRUCTION—WHEN AND HOW TO START.—“At the age of six,” said Mr. William H. Potter, A.B., D.M.D., Harvard University, at the Congress, “a child can understand the value and uses of its teeth and, when properly instructed, can assist in carrying out measures for their preservation.¹ . . . Cardinal principles about the teeth should first of all be presented to them in print. These can be included in a book on general hygiene, but it is better if they can be printed in the form of a short statement and pasted on the fly-leaf of a textbook, and also printed in large type and hung upon the school wall.” (Cf. *Aids to Fitness*, 1d.)

[The whole paper (pp. 595–598) will repay perusal by anyone anxious to educate children in oral hygiene.—Ed.]

PART OF HOME AND SCHOOL.—“Prevention of caries,” wrote Dr. J. G. W. Boleyn, Asst. S.M.O., Durham County, in 1913, “would be best attained by a return to a simple diet, maternal feeding, and by adoption of a universal habit from early childhood of cleansing and rinsing the mouth after every meal and especially at bedtime. Much can be done in school by teaching the value of foodstuffs, and their relation to caries, the necessity for regular meals, inculcating a desire for fresh fruits rather than sweets, and in the case of elder girls, the importance and necessity for the breast feeding of infants.”

A BROKEN REED.—“Observations made by Dr. McCullough,” observed Dr. Herbert L. Wheeler, of New York, at the Dental Congress, “who has charge of the dental service of the Department of Health in the City of Philadelphia, on over three thousand school children under fourteen years of age showed that in mouths where no toothbrush was used clean

¹ For “Lecture to Teachers,” by Dr. Wheatley, see *Rearing an Imperial Race*, 8s. 6d., pp. 294–300.—Ed.

teeth were free from decay, and that where decay existed, even though the brush had been used, the teeth were dirty on surfaces not involved by decay. Dr. McCullough's contention is that the use of the toothbrush is not as effective in keeping the teeth clean as is the proper use of the tooth itself."

Mr. Herbert Smale and Dr. Carmal Jones, in a joint paper in the Dental Section of the British Medical Association, Birmingham, July 26th, 1911, made a vigorous assault on the time-honoured respectability of the toothbrush. They quoted a number of experiments showing the variety of colonies of bacilli which can be cultivated from an ordinary specimen of the familiar instrument, and left one with the impression that the toothbrush was an instrument of foulness and disease rather than of cleanliness. Even with antiseptic powders or washes there is no safety, as the efficacy of such things was proved to be practically nil.

"Is the public ever to be deluded," asked Mr. Richmond Dunn, L.D.S., New Zealand School Medical Service, in the *Dental Record*, October, 1920, "by quack advertisements, and even by dentists, into the belief that the real preventive of dental disease is a continual use of the toothbrush and some form of confectionery sold as 'tooth paste'? Is not this another part of 'the broad and pleasant road'? Did you ever hear of a toothbrush or a patent dentifrice saving a single tooth? Are not the best users of the best toothbrushes our best-paying patients? Is this all the use we are going to make of the enemy's propaganda, to advise a toothbrush so many times a day, and a visit to the dentist every six months? Had not we better tell them that the increase of dental disease has been in direct ratio to the growth of the toothbrush habit? Why lull them any longer into a sense of false security, and pauperise them to rely on something outside their own efforts and control?"

LESSONS IN RHYME.—[Miss Clara Grant, Headmistress of Devons Road Infant School, Bow, and Fern Street School Settlement, a pioneer enterprise, which has won for its founder a more than national reputation, gives some account in *National Health*, October, 1917, of her methods of teaching hygiene. The article is illustrated by samples of the rhymes

through which various lessons are enforced. Here we have only space to quote two :—Ed.]

“ And little children must not say
 ‘ My crusts I cannot eat,’
 For crusts are good for little teeth,
 To make them strong and sweet.”

“ If you want to be healthy
 Without any doubt,
 Take plenty of water
 Within and without.”

But do not drink at meal times (as a rule) or our mouth juice will be too watery to do its work.

AIDS TO FITNESS.

(No. 1.)

[It will not be judged inappropriate that a revised version of this little sheet, which since 1912 has borne a prominent and honourable part in the campaign for enlightened methods of oral hygiene, should be accorded the first place. It seems probable, as Mr. William Fisk, L.D.S., President, School Dentist Society, anticipates, that the new issue will find favour, not only in all classes of schools and clubs for children and adolescents, but also in the waiting rooms of clinics and maternity centres, as well as of medical and dental practitioners. For the story of its origin the reader is referred to “ Educational Methods Among Children and Adults,” page 314.—Ed.]

20th Thousand, Revised.

Food Education Society Leaflet No. 2.

A Conference about the health and food of boys and girls at boarding and day schools was held at the Guildhall on May 13th, 1912, the Lord Mayor of London presiding.

The Times in a leading article (May 15th) said of it : “ The Conference is evidence of the attention that is now being paid to a subject too long neglected. . . . We may hope that a considerable step has been taken towards the development of a rational system of school diet (and it may be added, hygiene), to which all schools will by degrees approximate in practice.”

It was conclusively shown that increased attention to these matters leads to a higher standard of health and greater physical and mental fitness.

SOME OF ITS LESSONS.

1. Remember your teeth, like the rest of your body, require exercise, and that without it they decay.

2. Your jaws, too, will not develop without exercise.

The swallowing of soft foods does not give this.

AN OUNCE OF FACT.—A famous American, Horace Fletcher, found himself at the age of 40 broken down in health and rejected by the insurance companies. By attention solely to mastication, he was able a few years later to show greater strength and endurance than any of the athletes at Yale University, though he had had no training. On his fiftieth birthday he rode nearly 200 miles on his bicycle without getting either stiff or tired, and 50 next morning before breakfast. At 60 college, university, and club records of both strength and endurance were broken by him.

3. You may not have time or opportunity to “Fletcherise” thoroughly, but you can try, as he did, by eating slowly and by careful mastication, to enjoy the taste of your food as long as possible.

4. Lose no chance of eating crusts, “scrunch” (stale bread dried in the oven), or rusk, particularly with and after porridge, milk pudding, blanc mange, jam roll, cake, bread and marmalade, jam or honey, or other soft, starchy, or sugary food. Make a point of ending your meals with crust or “scrunch,” or raw and juicy fruit, *e.g.*, apples, oranges, or raw salads.

These are Nature’s ways of cleaning the teeth.

Rinse the mouth out well after every meal.

5. Drink as little as possible at meals.

(1) Nature provides us, in the shape of the gastric juices and saliva, with exactly what we require to prepare our food for digestion and to clean our mouths.

(2) Much of our food contains a high percentage of water.

6. The drinking of water between meals, and especially early in the morning, is good.

7. Always give fresh and dried fruit or honey (which contain sugar in its natural state) preference over sugar, sweets, jam, marmalade, or stewed fruit.

8. "Large quantities of meat are not essential." (Extract from the *Lancet* summary of the conclusions of the Conference.)

9. Be moderate in the use of condiments (mustard, pepper, vinegar, sauces, and pickles) and of sugar.

10. Abstain from eating when not hungry, and from "stodging" between meals.

Edison, the famous inventor, warns us against "stoking our engines with too much coal."

11. In particular, sweets, chocolate, biscuits, or milk should not be taken between meals or before going to bed.

12. The "grub-shop" and the "tuck-box" are two of the greatest enemies to all-round fitness.

Several schools represented at the Conference allow neither, while the forty senior boys of one large school themselves almost unanimously voted the abolition of the "tuck-box."

If you will give a little thought to these matters, you will speedily find that colds and other so-called "minor ailments," such as indigestion, toothache, headache, biliousness, will become *the exception*, and good health, with success at work and at games, *the rule*.

A copy of the above may be obtained from the Hon. Secretary, Schools Committee, Food Education Society, Danes Inn House, 265, Strand, W.C.2, by sending a stamped addressed envelope. Further copies as follows: 1d. each. 1s. 6d. for 50.

HORACE FLETCHER'S COMMENT.

In acknowledging copies of *Aids to Fitness*, the late Horace Fletcher, who was a Vice-President of the National Food Reform Association, sent a letter from which the following are extracts:—

January 13th, 1913.

DEAR MR. HECHT,—You have certainly done me great honour by offering me as a model of physical recuperation as the result of careful eating, and I want to express my appreciation; but the last statement, that I doubled the

world's record at weight-lifting at 58, is too much of a claim. I have broken local—college, university, club, etc.—records of both strength and endurance as late as when I was 60, but it is improbable that I am in the champion class with professionals, and I do not make any claims.¹ I am also in fine form at 63, better, I believe, than any previous year.

There is one other misconception. Fletcherising is not tedious. With good, strong saliva and keen appetite, any lad should be able to fletcherise to completeness and fulfil all the requirements of his personal responsibility in nutrition in 40 minutes daily.

While I do not discredit any food that Nature permits as nourishment for man, the preponderance of evidence is on the side of vegetables for greatest safety in feeding children. *No* meat is essential and *all* meat *may* be harmful in some degree, while *no* meat is ever *essential*.²

I have been associated with experiments, and have participated in them for the past two and a half years, that prove these conclusions, and this evidence will be available shortly. I am happy to say that the whole question of rational nutrition is becoming more and more simplified.

I would like 50 copies of the *Aids to Fitness*.

Sincerely yours,

HORACE FLETCHER.

RULES FOR RIGHT EATING.³

By A DENTIST.

1. Don't eat for the sake of eating—wait until hungry.
2. Don't eat when angry, worried, or when you cannot enjoy your food.
3. Chew all solid food until it *swallows itself*.
4. Get all taste out of liquid food by sucking or sipping.
5. Stop eating when the appetite begins to say "*enough*."

¹ The next edition was amended to accord with the statements quoted.—Ed.

² Horace Fletcher has the support of Sir Henry Thompson, who holds that "flesh-eating is by no means a natural taste with the young," and contends that "if meat did not appear in the nursery until the children sent for it, it would be rarely seen there and the young ones would, as a rule, thrive better on milk and eggs with the varied produce of the vegetable kingdom." See *Diet in Relation to Age and Activity*, 4th ed., pp. 69-70. John Locke also deprecates giving flesh, at least till the child be two or three years old.—Ed.

³ Reprinted by permission from the *Daily Mail*, May 2nd, 1917.

6. You may lose weight at first, but in a little time you will find your normal weight and stop.

7. Don't think about the number of chews or sips, but only of the enjoyment of the taste.

8. Don't imagine that meat is necessary to strength.

9. A week of careful attention of learning how to eat, as above, will put you in the habit of it, so that you will not have to trouble yourself about it after a while.

10. Remember that dietetic righteousness means less money, cost, and more solid enjoyment of food; and also, that it makes it easier to be righteous in other ways.

A QUESTIONNAIRE.

[When preparing for the first Guildhall School Conference a questionnaire was, at the instance of Dr. T. N. Kelynack, incorporated in the invitation. It doubtless had some educational value, which was enhanced by the exhibition in the corridors of the answers received, and their inclusion in the Report. A similar course was followed the next year. The appended questions were designed to accompany the invitations issued to the Manchester Conference. Yet, though warmly approved by several members of the Education Committee, including the chairman, Dr. Harry Campbell, there was lacking that complete unanimity without which they could not be issued. In the hope, however, that they may prove suggestive and promote furious thinking in quarters where it is badly needed, they are now published. It must, however, be clearly understood that the responsibility is solely mine.—Ed.]

1. State the number of your meals, with the approximate hours. Do you eat as well as drink at afternoon tea, or at other times between meals?

2. In what form is your food usually served—*i.e.*, soft (sloppy) or hard (compact)?

3. Are you in the habit of taking cut bread and butter (or margarine) with or without jam, marmalade or honey, sandwiches, bread and milk, milk puddings, blanc mange, junket, cakes and buns, as well as mince, mashed potatoes, and other vegetables?

4. Do you eat chiefly, or exclusively, wholemeal bread made from finely and uniformly ground flour, and are unpolished rice and pot barley generally used in your household ?

5. Is crust given preference over crumb, oatcake over porridge, and are dried or pulled bread, thin toast, crisp biscuits, or rusks usually on the table throughout each meal ?

6. Are vegetables cooked "conservatively," so that their salts are preserved ?

7. Are fresh fruits and raw salads freely used, and fresh and dried fruits favoured as against jam or marmalade ?

8. Enumerate the foods and drinks to which you generally add sugar—*e.g.*, porridge, puddings, stewed or raw fruit, tea ?

9. Do your family, or you yourself, eat sweets or chocolates between meals, or last thing at night, or only as part of a meal ? If you do so, do you take the precaution of ending with fruit or green stuff, or of rinsing the mouth immediately after ?

10. By what means do you endeavour to ensure that the mouth is left physiologically clean at the end of meals, and particularly last thing at night ? Do you realise that most disease of the teeth and much other disease is due to neglect of this precaution, and that with proper care sound teeth can be preserved to extreme old age ?

11. Is drinking at meals discouraged, and drinking apart from meals ; and, above all, early in the morning and last thing at night practised ?

12. What steps are taken to secure sufficient time for meals, especially breakfast, so as to render possible the thorough mastication of food ?

13. Do you ever have a one-course meal ? If so, give the reason for and details.

14. Describe any methods employed to develop and exercise children's jaws and teeth.

Consult :—

Aids to Fitness, 1d.

Why Worry About Sugar ? 1d.

Diet for Brain Workers, 1d.

Feeding of Children, 3d.

Feeding of Young Children, 3d.

CHIEFLY ABOUT METHODS

Dietaries Suitable for Secondary Schools, etc., 1s. 3d.

Our Children's Health at Home and at School, 5s.

Rearing an Imperial Race, 8s. 6d.

Any of the above, with complete list of publications and particulars of lectures, may be obtained from the Food Education Society.

Those connected with institutions for children or adolescents, or engaged in the feeding of numbers, are invited to contribute any of the following:—

- (a) Rules for the conduct of a meal, especially such as ensure adequate time being available, and discourage hasty eating.
- (b) Precautions taken to promote the maintenance of a hygienic state of the mouth and teeth.
- (c) Tuck shop and tuck box regulations.
- (d) Rules, or other measures involving practical instruction in elementary physiology and mouth hygiene.
- (e) Experience of teaching oral hygiene, including mastication, to children, adolescents, or adults.

REAL FOOD CONTROL¹

By COUNCILLOR G. PICKUP HOLDEN, *Vice-Chairman, Darwen Public Health Committee.*

COUNCILLOR G. P. HOLDEN'S LATEST CLAIMS.

LONDON COUNTY COUNCIL TO FOLLOW DARWEN'S LEAD.
THE NATION NEXT!

[We have here an account of one of the most remarkable and valuable experiments to which the exigencies of the Great War gave birth. Not even, however, the dogged pertinacity and zeal of a typical Lancastrian could break down the walls of official apathy and prejudice and persuade the Powers that Be to embark upon a course that might and probably would, have saved millions of pounds sterling, besides yielding a great improvement in the public health. —Ed.]

We shall shortly all be under Food Control Committees. Our own food control is the best. The real food control is in our mouths. I have proved on 7,000 school children in

¹ Reprinted by permission from the *Darwen News*, September 1st, 1917.

Darwen, Lancashire, that lessons controlling food waste by "bolting," lessen consumption of bread by 25 per cent. and produce at the same time increased nutrition. Each child was taught practically. Slices of bread, cut into half-inch cubes were carefully masticated by the children under the supervision of each teacher, previous explanation having been given showing how complete mastication converted bread (starch) into grape sugar by salivation. The lessons proved most interesting to both teachers and scholars. Recent reports from the schools prove results. The following is a sample :—

ST. GEORGE'S SCHOOLS,
Darwen.

Report respecting mastication lessons given in these schools :—

The children are eating 30 or 40 per cent. less bread. The children are healthy and strong; less absence for minor ailments, indigestion, etc. Average attendance increased from 90 per cent. to 94·5 per cent. More mothers are baking their own bread. Since commencing this course of lessons the average amount of bread consumed has gone down in various households from 4 lb. per head to 2½ lb. weekly.

The following are figures given by the children themselves from other schools showing actual amount of flour baked before and since lessons commenced :—

Reduction of flour consumed by various families after lessons.—From 30 to 20 lb. ; from 20 to 16 ; from 15 to 10 ; from 10 lb. and 4 loaves to 7½ and 2 loaves ; 10 lb. for 4 people ; 10 lb. for 5 ; 7 lb. for 3 persons formerly consuming 10 lb.

During these lessons on the Chittenden method of feeding (dry feeding with complete mastication—Fletcherism) it was stated that the Germans had already adopted this method of food saving. A remarkable confirmation of German results has just been received from Copenhagen. A well-known American (member of the American Food Commission recently feeding the Belgians) writes : " I have just seen in an English newspaper here (*The Daily Express*) results of tests on school children in Lancashire. We adopted in Belgium the same method, especially in case of compulsorily limited rations, and effected the same result. The Germans

have adopted the method for over twelve months. It has been a common report in Germany—‘The Chittenden method of feeding is as valuable as the Hindenburg method of fighting.’ Now the Chittenden method has the lead in usefulness. Many pamphlets have been issued officially; one was by the Quartermaster-General of the German Army, entitled *Germans Fletcherise*. I have seen one copy, but I am not able to procure it.”

We have followed Germany’s lead in conscription and ammunition manufacture, now in Food Control Committees. We have followed their lead in Daylight Saving, we shall have to follow it in Food Saving. Their daily use of this proved and practical remedy has helped to save them during their food shortage. Our neglect to adopt it adds to our daily waste. Daylight Saving and Food Saving are twin sisters. One, after long neglect and ridicule, has been adopted with great benefit; the other will be adopted, and will be of equal value. Food Saving is more important in this crisis than Daylight Saving.

GEORGE PICKUP HOLDEN, *Ex-Chairman, Council
Public Health Committee.*

Bank Top Mill,
Darwen, Lancashire.

August 28th, 1917.

P.S.—I notice from the *County Council Gazette* that the London County Council Education Committee have issued instructions to their 22,000 teachers to teach complete mastication to London’s 700,000 children. This is a great step in the right direction, but it requires to be taught completely throughout all elementary schools. Will any interested in furthering this method of food saving by education kindly forward their address so that complete details may be sent?

(I enclose reprint as follows from *The London Teacher*, June 29th, 1917):—

AN OPEN LETTER FROM A LANCASHIRE COTTON MANUFACTURER TO LONDON TEACHERS.

THE FOOD PROBLEM—SOLUTION, EDUCATIONAL.

I can prove to you that I know the solution of the food problem. I have already proved it in Lancashire. It is

educational. I want you to know it. When you know it, you will teach your children. When they know it, they will teach their parents. London's food-saving problem can be solved by your co-operation.

The solution of the food problem is in our mouths, if we will only use our brains.

The Ministry of Food also knows this solution. It claims more economy from its use than I do. It states that :—

Only proper mastication prepares food for absorption. Half-chewed food gives half its nourishment ; but it gives the digestive organs double trouble, and its masticator has to eat double the amount of it to get his nourishment. The quick eater is a quick food waster.

Eat slowly, you will eat half as much as you eat now, grow healthier and stronger on it, double your power of work, and save the food you are wasting.

To eat slowly is very difficult ; it needs concentration ; but if you eat slowly you need eat less. Five people out of ten are digging their graves with their teeth. As much food is wasted in the eating as in the cooking. (Section C Food Economy Pamphlet, *Waste in Eating*.)

In Lancashire, Darwen's results have proved these statements correct. Darwen's 220 teachers have taught its 7,000 children. They have taught the remainder of Darwen's 40,000 population.

London's 22,000 teachers can teach their 750,000 children. They will teach the remaining 4,000,000. Darwen's successful results have been achieved by the practical and scientific teaching of complete mastication to all its scholars.

Since April 24th, 1917, the consumption of bread by those practising complete mastication has been reduced 25 per cent. The nutrition and strength of the children have increased, while minor illnesses (indigestion, etc.) have decreased. At a total cost of £14 6s. (one-tenth of a penny per lesson meal) 28,000 lesson meals for 7,000 children have been provided. The simple practical way so successful in Darwen was by providing dry bread, cut into half-inch cubes, and carefully masticating each cube under the supervision of the teachers, after preliminary lessons on the digestive processes.

The scientific basis of food saving was taught by the visual experiment of Fehling's test for grape sugar. Nutrition is

produced by the conversion of bread into grape sugar by salivation induced by mastication. Half-mastication produces half-salivation, resulting in half-nutrition. Fehling's test proves that half the bread "bolted" passes through the body as undigested starch. This loss is in addition to the wasted energy involved in its attempted digestion.

I submit the following reports from the Medical Officer of Health (Dr. Haworth) and two Darwen schools :—

Health Offices, Darwen.

June 18th, 1917.

The school nurse and I have been through quite a number of the schools since you commenced your campaign for the better mastication of food, and we have been struck by the brighter and healthier look of the children. On looking round for a reason it became evident to me your words were having some effect. The time is too short for the method to show effects on the weights of the children, although in my own mind I have no doubt we shall see the results in the increase of both stature and of weight in due time.

F. G. HAWORTH, M.O.H.

Holy Trinity National School
(Senior Department), Darwen.

June 19th, 1917.

In accordance with promise I send you a few details of the success which has followed your addresses to the school children of Darwen on April 23rd, 24th, 25th, and 26th, 1917. On April 24th the teachers followed up the address by practical lessons. A supply of dry bread was provided (made of war flour), and the children were delighted, as well as surprised, to find taste and flavours which they had never before experienced. Dr. Haworth, the S.M.O., happened to be at school on duty, and he visited each class during the practical lessons, expressing his high appreciation of the value of the lessons not only from the point of view of the health of the children, but from the great saving in the amount of food consumed through the increase in the efficiency of the mastication.

The lessons were repeated, with practical work, each day for a week with much success.

The teachers have incorporated the subject in their syllabus of elementary science lessons, and at least once a week the subject is dealt with by talks, essays, and often by the children themselves bringing in their pockets small portions of food for experimental mastication.

Correct methods of drinking fluids are also explained practically. The habit of drinking during the progress of a meal is strongly deprecated. Each child was allowed to copy on foolscap and take home a list of suggestions on correct mastication, with a view to introducing and perpetuating the practices amongst elder brothers and sisters and parents. All children are consuming less bread. I am sure also that the general health, robustness, and looks of the children have improved. So far as I can get accurate and reliable information, I find that the bread consumed per person in the houses where the system is well practised is about 3 lb. per week per person on the average, and I am convinced that even this can be reduced.

CHAS. S. STANSFIELD.

St. George's Schools,
Darwen.

June 13th, 1917.

Below you will find a few facts respecting improved mastication as practised by teachers and scholars in this school since your lecture a few weeks ago.

Mothers are baking their own bread. Children are eating 30 to 40 per cent. less bread. Children are healthier and stronger. Children stopped bringing bread to school to stop waste. Average attendance gone up from 90 to 94·5 per cent. Head teacher eating 50 per cent. less bread but more of other foods, excepting meat, with no bad results. Assistant master, W. Tillotson, 80, Avondale Road, over military age, has the same results. Annie Cooper and Elsie Cooper, 123, Osborne Terrace; Nora Shorrock, 41, Belgrave Road; Mary A. Bell, 29, Heys Lane, assistant mistresses, all report the same results.

EDWARD BIBBY, Master.

P.S.—Since commencing new method of mastication their weekly consumption of flour baked has gone down from 4 lb. per head to $2\frac{1}{2}$ lb.

These are Darwen's results. This is true National Service. The food shortage is the great unsolved national problem. Teachers can solve it. I ask for your help.

GEO. PICKUP HOLDEN.

A NEW FORM OF FOOD SAVING.¹

[The appended letter was written by way of comment on some of the foregoing facts, as detailed by Councillor Holden in a letter which, under the title of "A New Form of Food Saving," appeared in *The Manchester Guardian* of September 5th, 1917. The resulting correspondence sheds fresh light on the heart-breaking experiences of so many reformers and incidentally reveals the strongly entrenched position of our educational bureaucracy, even in a crisis of unparalleled magnitude and with a bureaucrat so accessible, enlightened and enthusiastic as Mr. Fisher.—Ed.]

I read with keen interest, though without surprise, Mr. G. P. Holden's account of the success of his valuable experiment at Darwen. It has been my privilege to give during the past twelve months at economy exhibitions in various parts of the country informal addresses on the care of the mouth and teeth, with special reference to mastication, to innumerable classes of children, drawn, for the most part, from primary schools. Everywhere my experience coincided with that of your correspondent. At Stratford-on-Avon a teacher set the children to write accounts of the lecturettes. From these it was clear that my remarks had been closely followed. The children of Manchester and Salford were no less responsive. Their attitude and suggestions, which were both novel and entertaining, are described elsewhere (*cf. National Health*, December, 1916). The teachers, too, were generally alive to the importance of a subject which, as one of them remarked, "ought to be taught in every school." Secondary scholars have been appealed to with equally encouraging results; indeed, there is a waiting list of such schools anxious for talks on *Aids to Fitness*. This leaflet (post free, 2d.) was issued by the Schools Committee after the first Guildhall Conference (1912), for display on school notice-boards, or in dormitories, nurseries, and the like. It

¹ Reprinted, by permission, from *The Manchester Guardian*, Sept. 8th, 1917.

has found so much favour with adults that a special edition has been brought out for their benefit.

CHAS. E. HECHT,

Hon. Secretary National Food Reform Association.

14, Great Smith Street, Westminster,

London, S.W.1.

September 6th.

BANK TOP MILL, DARWEN.

September 19th, 1917.

I am obliged for your letter. Enclosed are details of the Darwen experiment. It is simply teaching by all teachers, to every class, of complete mastication, ensured by *dry* feeding, tested on *dry* bread, and proving the complete conversion of grape sugar from starch. It is largely based on "Fletcherism," although in order to keep it free from any possible objection to "fads," that word is kept in the background.

I have for the past four months been every week in London trying to induce the Board of Education, through Mr. Fisher (I have several times seen Mr. Pelham, his private secretary), to act in the matter, but it has been decided that the Board will not do anything, not even make a suggestion to the Education Authorities throughout the country to give these lessons. In any case the lessons would cost nothing, would call daily for attention to food economy and for the health of the children would be bound to be a considerable asset, especially in towns, such as in Lancashire, where the pernicious habit of "bite and sup" is seriously wasting food and strength.

I am just taking a little rest, as I have overdone myself a little, but if you feel that any service could be rendered by our meeting, I would be very pleased to have the opportunity of meeting you and any members of your Committee, and would come up to town to do so.

I notice Horace Fletcher is one of your vice-presidents. I have from his agents, Stevens and Brown, to-day, a copy of a telegram sent to them from Malmö strongly approving of my action and hoping to assist in any way possible. I have induced the London County Council Education Committee to instruct their teachers to give the lessons. I would be

obliged if you would let me know how they are being given. So far the L.C.C. has declined to provide the bread, and mastication, like multiplication, must be taught by a practical and concrete case, *not* by theory. I am having a careful analysis made in London by an eminent analyst, Dr. Campbell, F.C.S., London War Savings Association. He has shown during the past month by a series of experiments the total amount of grape sugar actually produced by 5, 10, 15, 20 and 30 seconds' mastication and I have a letter from him stating that the results will shortly be completed.

I will let you have them, or any other details, at any time, upon request. I now feel that, after the publicity I have given to this through the *Daily Mail*, *Daily Express*, *Leeds Mercury*, *Glasgow Record*, *Manchester Guardian*, etc., and the various public associations, that what it now needs is the official support of such an influential society as your own, or the Metropolitan War Savings Association. I am willing to do all possible, but it is now more than an individual's work.

What would you be prepared to do in the matter? Your big leaflet is word for word what I have been teaching here, but if such a notice received the support of the Education Minister, it could be propagated through every newspaper in the country, and lessons given from it in all elementary schools, by the Minister's one message sent to the Press Association without any cost. Why should it not be done!

G. PICKUP HOLDEN.

September 24th, 1917.

Thank you for your kind reply to my letter and the most interesting details of your campaign. Some time when you are in town with a few minutes to spare, I should welcome an opportunity of meeting you and talking matters over, but do not feel warranted in accepting your kind offer to come to London specially. I will endeavour to get particulars of the methods adopted in the L.C.C. schools. The result of Dr. Campbell's experiments would be very acceptable.

On the general question, Government Departments are hard to move, and there is no reason to suppose that we should succeed where you, despite so much persistence, have failed. It is not safe to argue from German precedents, since people there are accustomed to and ready to submit to Government

and centralised action, which would be resented here, both by local authorities and the public.

CHAS. E. HECHT,

Hon. Secretary, National Food Reform Association.

“ FLETCHERISING.”

[This was an inset to the second Annual Report issued by the Central Council of the Royal New Zealand Society for the Health of Women and Children, and the twelfth Annual Report of the Dunedin Branch. It is apparently from the pen of the distinguished President of the Society, Dr. Truby King, whose magnificent work for Child Welfare is so widely known, not only at the Antipodes, but in this country, thanks in part to the generosity of the New Zealand Government in recently lending his services to us for a year, extended by request. The article will be found of the deepest interest by those who seek a critical, albeit friendly, estimate of the permanent value of the teaching of Horace Fletcher.—Ed.]

A REMARKABLE MAN.—This is a word that will probably be added to our vocabulary, just as Pasteurising has. A few years ago Fletcherising was the vogue in dietetics. The death of its author early this year has given fresh prominence to it. As part of Horace Fletcher’s discovery is a permanent contribution to dietetic science and part of it a pernicious heresy, it may be worth while to speak of both in some detail.

We borrow our facts from an article by a distinguished physician in an American magazine. Horace Fletcher was a somewhat remarkable man. According to his own account, he had lived a gay life. He was a *beau vivant*; he placed no restriction on his appetites of eating and drinking. He was an athlete, an expert swimmer, and a good “sport.” When approaching fifty Nature presented bills and asked for payment. She is an inexorable creditor, and decrees that we must reap as we sow. Fletcher was threatened with a physical breakdown. His application for life insurance was rejected. He recognised the seriousness of the situation, and set himself to find a remedy. This he found in the thorough chewing of the food. That was his first and fundamental discovery.

A MISSIONARY OF MASTICATION.—He became a missionary of it—a missionary who was himself an object lesson of the virtue of the gospel he preached. He addressed audiences at Chautauqua and other notable places throughout America. He managed to influence eminent professors of physiology and other scientists in his propaganda. He got the ear of President Roosevelt and General Wood, at that time Chief of the Staff of the United States Army; and finally a group of military men were detailed to serve as subjects of the experiment. The experiments covered a period of about nine months. They were conducted under the direction of Professor Chittenden at Yale University. One of the most important of these experiments was the discovery that “the amount of protein needed for maintaining the body in a state of physical fitness is less than half that claimed to be necessary by Atwater and others.” This was a most significant achievement, and Professor Chittenden’s experiments have become classical in the history of dietetic development. It is also noteworthy that it was a layman who by his zeal first broke down indifference and opposition and won scientific attention to what has since been regarded as a valuable contribution to correct living.

Fletcher’s theory was that every morsel of food should be chewed in the mouth till it is reduced to a liquid state and has become tasteless. The quick-lunch business and bolting of food have sent millions to premature graves. As Fletcher pithily puts it in his book *The New Glutton or Epicure*—a rather uncouth title—“unless a person has a pressing engagement with his own funeral, what sense is there in hurrying with his meals?” “While any taste is left in a mouthful of food in process of mastication or sucking, it is not yet in a condition to be passed on to the stomach.”

EVERY MAN HIS OWN FOOD CONTROLLER.—This contention was based on another discovery that Fletcher made, and which is really as important as the chewing one. He found that every man possesses in his nerves of taste “a food administration which is capable of instructing in relation to the quality of his food as well as its quantity.” Fletcher was probably the first to call attention to this function of the palate. Its reality has since been demonstrated in experi-

ments in the feeding of certain animals by Osbourne and Mendel. In obedience to the suggestions of this regulating sense, Fletcher was led on, step by step, to abandon the use of flesh foods. By and by he also gave up the use of wine, tea, and coffee, and other condiments. The fascination of the pipe held him captive for a longer time. But he finally gave it up also. He said that when he chewed his food carefully, and especially after he had renounced the use of these other foods and condiments, the appetite for tobacco gradually disappeared.

FLETCHER'S CONTRIBUTION TO DIETETICS.—These, then, are the more important and permanent contributions which Fletcher has contributed to the science of dietetics. He demonstrated the value of thorough mastication and of not swallowing any food till it is practically reduced to a liquid in the mouth and has become tasteless ; the discovery of a food regulator at the back of the palate ; the fact that when the food is thus chewed it reduces the amount necessary for vitality by more than one-half, and through Professor Chittenden's experiments that we were all consuming about double the amount of protein necessary for physical fitness, and so suffering manifold ills. One other thing Fletcher claims as an essential part of his dietetic system—cheerfulness. Lack of this, he says, has as bad an effect on digestion as haste in chewing. “ Don't chew anything when you are mad or sad, but only when you are glad that you are alive, and glad that you have the appetite of a live person, and one that is well earned.” And he asks fairly enough that you take his system as a whole, and not in parts, if you are going to test its worth.

AN ADVERTISEMENT FOR HIS THEORY.—As to its efficacy upon himself there can be no doubt. It added years to his life. He was 50 when he broke down ; he was 69 when he died. It has been pointed out that Fletcher's theory of mastication is not of universal application. “ In cases of hyperacidity, in which the stomach makes an excess of gastric acid, the food should be chewed as little as possible, since more chewing makes more acid.” Fletcher's theory of reducing all food to a liquid in the mouth led him to discard insoluble substances, as the seeds and skins of fruit, and to restrict his dietary to

soft foods, soups, purees, and liquid foods. As he says in his book : " If what taste rejects, after having selected nutriment out of a morsel of food, is dirt, what sense is there in allowing it to contaminate and burden the delicate organs of digestion ? . . . An indigestible morsel of food in the stomach and all the way through the twenty or twenty-five feet of the convoluted intestinal canal is like a bull in a china shop. What sense is there, then in smashing the delicate utensils in the laboratory of our Mind-Power Plant by rushing ' bulls ' past sentinel taste ? "

* * *

THE OTHER SIDE.—Certain obvious and evil results followed from this theory. First, there was the decay of his teeth. But there was the still more serious one of obstinate constipation. A bowel movement came only once or twice a week—perhaps not so often. Fletcher argued that this was good ; that thorough chewing secured such perfect digestion and such complete absorption and utilisation of the food that there was no residue for germs to act upon, and so was a sort of sterilising process. And as a proof of this the defecations were quite odourless. Many people who adopted Fletcherism had the same obstinate constipation, and were led to blame the chewing for it. For instance, the distinguished psychologist, the late Professor William James, was for a time one of Fletcher's most enthusiastic converts ; but " I had to give it up after a three months' trial. It nearly killed me." Here was the secret of his error : the constipation of the disciples of Fletcher was due to the elimination of all bulk from their food. Even if the mastication was so thorough as to reduce the indigestible bulk to an irreducible minimum, other elements have to be dealt with in the digestive tract. As his physician explained to Fletcher, the bile is " a highly poisonous excretion, being six times as toxic as urine. . . . Both bile and intestinal mucus are putrescible substances, and putrefaction always occurs when there is long delay in the colon. . . . His defecations were odourless only because they had been retained so long that the malodorous indol and skatol had been almost wholly absorbed." There is reason to believe that Fletcher saw the error of his ways in this particular, and was led to correcter views on the subject. But unfortunately it was too late. The mischief had been

done. His system had been undermined by years of struggle against colon poisons, and was unable to recuperate. But his other discoveries have stood the test of time, and are essential factors in a true dietetic science.

* * *

THE MORAL.—The writer of the magazine article to which we have referred points the moral that adorns the tale of Fletcher’s career. One of the most obvious is, of course, that “ too late ” is a maxim as true in regard to health as in regard to business, or politics, or religion. Fletcher was nearly fifty before he made the discovery that he was destroying the foundations of his vitality by his methods of life. He was the servant of his desires. He ate and drank as it pleased him, thinking, as we all do, that to-morrow will be as this day, and even more abundant. But it is a perilous game to lose our credit to Nature. Her bills come in not on the first Saturday night, perhaps, but certainly sooner or later, and usually when we are shortest of funds, or it may be bankrupt altogether. Fletcher, by a radical change in his habits, was enabled to “ come back ”—to use a sporting phrase—for a time, and he thought he was saved. But the damage had been done. The tree had been sawed too far through, and could not stand when the storm struck it. We are all imbued with the gambler’s passion. But when the stake is health and life, we would do well to be careful. Yet few of us are. Many of us, indeed, are reckless. We do not learn from the experience of others. We throw away the gifts of the gods as if they were of no concern, or as if we could recover them when we pleased.

But you can’t turn curds to milk again,
Nor Now by wishing back to Then ;
And, having tasted stolen honey,
You can’t buy innocence for money.

The jewel of health is one of the most precious of life’s assets, and ought to be guarded with the utmost care. Yet we go on repeating the old blunders and errors relative to it, in spite of the warnings of every day.

A BENEFACTOR OF MANKIND.—Fletcher is to be commended for the radical change which he made when he saw his mistakes, and for the generous and unselfish efforts which he put forth

to spread abroad his discoveries and to help his fellows towards new health and power.

If the change in his habits had occurred ten years earlier, very likely he would have been able to resist the inroads of time and of disease for ten or twenty years longer. As it was, he was well compensated for his noble effort to put himself in harmony with Mother Nature. His reform gave him certainly more than ten additional years of life, and he used his new lease in such a way as to set in motion beneficent forces which must result in the saving of millions of human lives. His name, like those of Graham and Pasteur, has become a common noun, and is inscribed upon that most wonderful and imperishable of all the monuments of human progress—the dictionary of the English language.

AT THE CHILDREN'S WELFARE EXHIBITION.¹

BY CHARLES E. HECHT, M.A.

TEETH MODELS AS EDUCATORS.—As secretary of the National Food Reform Association I lately spent a strenuous ten days in charge of our exhibit at Olympia. Our visitors were drawn from all sorts and conditions of people. They included a fair sprinkling of clergy and ministers, members of the scholastic, medical, dental, and nursing professions, social workers, tradesmen, and artisans, for the most part accompanied by their families.

The models of teeth proved a constant source of interest and educational value, alike to young and old. They doubtless also served, in some small measure, as an antidote to the not far distant toffee stall. Incidentally they were the means of throwing some useful light on a problem, the importance of which, in the opinion of a competent judge, is not inferior to that of tuberculosis.

CARIES AND TUBERCULOSIS.—Further, as this number of *National Health* is specially concerned with the latter subject, it seems not inappropriate to point out the close connection existing between dental decay and this dread disease. (Here follows quotation from Professor Muller, see p. 23.)

¹ Reprinted by permission from *National Health*, February, 1913.

REMARKABLE CASES.—Among the many interesting experiences related at Olympia the following may be singled out for mention. One day a mother informed us that by careful feeding her son had been enabled to put off his first visit (for treatment) to the dentist until after his coming of age. This record was capped by the story of a father dying at 79 with every tooth intact and only one stopped, and of another, who at 75 had never had toothache or used a toothbrush, but always made for crusts and was able at that advanced age to crack nuts with his teeth. Then there was the lady who admitted, for the information of readers of this magazine only, that she had turned 30, who had never been to a dentist since the arrival of her second teeth, and only once for the first set, or, again, the mother concerning one of whose girls a dentist had observed: "I shall go to the workhouse before your daughter gives me anything to do."

"TOO MUCH TOOTHBRUSH."—The toothbrush came in for a good deal of candid criticism, and it is clearly possible to suffer from "too much toothbrush," to use the words of one of our visitors, a dentist, apropos of a recent case. One day, indeed, a lady, after reading Sir George Newman's statement that "Primarily the cleanliness of the teeth depends upon the character of the food," exclaimed: "This certainly confirms my theory; my brother would never use a toothbrush, and his teeth are the best in our family." At the other end of the scale we had the mother of a schoolboy, who was one of two out of a hundred lads, reported by the school medical officer as having perfect teeth. He had, however, the advantage of a mother who held the London County Council certificate in home nursing.

These, however, were the exceptions, and one came across many distressing examples of the victims of ignorance, and I fear, too, I must add indifference or prejudice, among all ranks of life. It is encouraging, however, to find that the practice of paying periodic preventive visits to the dentist appears to be on the increase.

"AIDS TO FITNESS."—Of our literature, the special children's welfare number of *National Health* found many purchasers.¹ *Aids to Fitness*, which figured as the magazine's leaflet

¹ Upwards of 600 copies were sold in ten days to children and adults.—Ed.

for the month, was likewise in much request, and not a few schoolboys, public, private, and elementary, laid out their pennies in this Spartan fashion. Parents, too, were not slow to recognise the value of the "Aids." "I will put this up in Lucy's bedroom," remarked a mother. "Now, John, it is you who ought to buy this," observed a father, and a penny was indeed speedily forthcoming from John's pocket. The "grown-ups" were, however, not always equally wise. Thus, one remarked that the worst of it was it would take all the pleasure out of life, while another pleaded that he worked twelve or thirteen hours a day, and had no time for "hobbies."

SOME SPLENDID SPECIMENS.—These somewhat desultory notes may close with a brief reference to some splendid specimens of manhood among our visitors. The first hailed from London's Northern Heights, where octogenarians and even nonogenarians seem to flourish like green bay trees. He was 80 years of age, though one could sympathise with the cocksure foreign doctor who had set him down a couple of years previously as "62, not a day more." Another equally healthy veteran opened the conversation by remarking that the only fault he had to find with the Society was that it had not begun work fifty years previously. A third, who belonged to the artisan class, and was close upon 70, volunteered the statement that he had not visited a doctor for thirty years (on which occasion he had paid £36 10s.), and that he had taken no medicine since. One of his rules was never to eat or drink unless he felt the need to. Sometimes he would skip a meal, sometimes even a day. He took little meat, no alcohol, and, as a rule, neither tea nor coffee. He was, however, a moderate smoker. Lastly, on the opening day, I met in the crowd Dr. John Clifford, looking, as I ventured to tell him, not a day older than at our last encounter in 1906. Some men and women seem to possess the secret of perpetual youth. What is it? In Dr. Clifford's case I suspect it to be a combination of simple living, high thinking, and hard work, but as his projected visit to our stall did not come off, this query must remain unanswered.

PART II

A NATIONAL CONFERENCE

(A) FIRST MEETING OF THE GENERAL COMMITTEE

The first meeting of the General Committee of the Conference on the Prevention of Diseases of the Teeth was held in the Lord Mayor's Parlour, Town Hall, Manchester, on December 1st, 1919.

There were present: Mrs. Herbert Ashburner, hon. secretary, Manchester Ladies' Public Health Society and Salford Mothers' Guild; Miss H. K. Armitage, hon. secretary, and Mrs. Hadfield, Schools for Mothers; Miss Winifred Andrew, secretary, District Nursing Association; Miss L. Blyton, Sick Poor Nursing Institution; Mrs. Walter Beer, hon. secretary, and Mrs. Lillie, Girls' Club Union; Mrs. Janet Blair Zimmern, Invalid Children's Aid Association; Mrs. E. A. Philips, Women's Guild of Service; Mrs. George King, Maternity and Child Welfare Committee; Miss Alice M. Jackson, vice-principal, Municipal Training College; Dr. John Ward, hon. secretary, Pathological Society; Mr. Arthur Gaddum, District Commissioner (Boy Scouts); Miss M. Fitzgerald, Miss M. Lennard, Dr. James Niven, Medical Officer of Health; and Dr. W. St. C. McClure, Deputy Medical Officer of Health; Messrs. T. C. Horsfall, John Higham, H. W. Norman, L.D.S., W. H. Walton, B. Wilde, headmaster Blackley Municipal School; Charles E. Hecht, hon. secretary, Food Education Society.

Among those who accepted invitations, but were unable to be present were: The Rev. S. F. Collier; Mr. Spurley Hey, M.A., Director of Education; Miss E. J. Ross, Principal, Municipal Training School of Domestic Economy and Cookery; Councillor Caroline Herford, J.P.; Mr. George Gill, chairman, and Mr. Fred Hargreaves, hon. secretary, Crippled Children's Help Society; Miss Edith Moorhouse, secretary, National Council of Women; Mr. Fred Scott, Manchester and Salford Sanitary Association; Mr. Edwin Houghton, L.D.S.; Mr. David Headridge, L.D.S.; and Mr. J. N. Gibbons, L.D.S., hon. secretary, Odontological Society; Mrs. Macintosh, Mr. T. Lomax. The Right

Hon. the Lord Mayor, Alderman Tom Fox, J.P., who had promised to preside, was detained at a meeting of the Parliamentary Committee of the City Council.

Dr. Niven having been moved to the chair, which he declined to take, the meeting requested the hon. secretary to act.

Apologies were announced from the following : The Bishop of Manchester, owing to important Diocesan engagements ; the Bishop of Salford ; the Vice-Chancellor of the University ; the Right Hon. J. R. Clynes, P.C., M.P. ; Miss Sara Burstall, Head Mistress, High School for Girls ; J. Lewis Paton, M.A., High Master, Grammar School ; Sir Charles Behrens, J.P. ; Sir Arthur Haworth, Bart. ; Sir William Milligan, M.D. ; Sir William Thorburn, K.B.E., C.B., C.M.G., M.D. ; Principal J. W. and Mrs. Graham (Dalton Hall) ; Professor Dean, President Pathological Society ; Miss Alice Behrens, County Commissioner and Deputy Chief Commissioner for the North of England Girl Guides ; Miss Norah Teale, secretary, Invalid Children's Aid Association ; Miss Beatrice Rogers, Warden, University Settlement ; Miss Margaret Langdon, George Campion, L.D.S. ; J. Hilditch Mathews, L.D.S., Dean, Dental Hospital.

SUBJECT OF THE CONFERENCE.—THE HON. SECRETARY, FOOD EDUCATION SOCIETY : I desire to acknowledge the invaluable sympathy and support of the Lord Mayor and Lady Mayoress. As one born and educated in your midst, whose father was an honoured (I might without exaggeration say beloved) citizen, and whose uncle for many years took a prominent part in public life here and was long a member of the City Council, I am assured of an indulgent hearing. In view of the influential attendance there is no need to justify the selection of the subject for the Conference. A medical member of our Society, lately returned from serving in France, wrote : "I send my subscription with enhanced pleasure, owing to the fact that you are tackling the teeth question, the *most urgent matter* before the nation."

CHOICE OF PLACE.—As to the choice of place, Miss J. Halford, Secretary, National League for Health, Maternity, and Child Welfare, writes : "I am delighted to hear of your forthcoming Conference on the Preservation of the Teeth,

and think it only right that Manchester should have the chance of a Conference of this kind occasionally, instead of all being held in London." As a renegade provincial, I endorse her view.

MANCHESTER AS PIONEER.—The suggestion, which has been received here on all hands with enthusiasm, has, moreover, a special appropriateness. In the history of social and sanitary reform, this great city has earned honourable pre-eminence. Witness its pioneer popular lectures on medical and scientific subjects, its work for health, and child welfare. Indeed, the Manchester and Salford Sanitary Association and the Manchester Ladies' Public Health Society and Salford Mothers' Guild are, I believe, the oldest institutions of the kind in the country. How far-reaching their influence has been may be realised when it is mentioned that the Hampstead Health Society, the oldest in London,¹ and the mother of a considerable family, was largely modelled on Manchester lines. I would here desire to acknowledge the extent of the service rendered by such citizens as Mr. T. C. Horsfall and Dr. Niven. Their devotion and zeal have been an inspiration to myself, as doubtless to many.

Manchester, again, supplies the earliest, and one might almost say the classic, illustration of successful co-operation between the municipality and a voluntary agency in the relationship existing between the Ladies' Public Health Society and the Corporation. It is only by the co-operation of the local health and education authorities, members of the medical, dental, nursing, and educational professions, social workers, and the sympathy and aid of the general public, that it is possible effectively to grapple with grave problems, such as the one we are facing to-day.

DENTAL PROFESSION.—We are fortunate in having the support of the dental profession, to which we owe so much, and which must lead in this campaign. The Conference has the approval of Mr. Montagu Hopson, President, British Dental Association; of Mr. Hilditch Mathews, Dean of the Dental Hospital; Mr. George Campion, and many others.

The British Dental Association and the School Dentists'

¹ Founded 1902, and lately merged into the Hampstead Council of Social Welfare.—Ed.

Society are represented on our Education Committee in London, which will determine the final form of the programme. In drafting this, we hope that members of your Odontological Society and the local branch of the British Dental Association will have a large share. The project is also supported by Dr. Alfred Cox, Medical Secretary, British Medical Association; the Rev. J. C. Pringle, late Secretary, Charity Organisation Society; and last, but not least, by your Medical Officer of Health and School Medical Officer.

FOOD EDUCATION SOCIETY.—A few words as to the qualifications of the Food Education Society for the task. Founded in 1908, and until recently known as the "National Food Reform Association," it is happy in having the support of leading members of the medical, dental, and nursing professions, as well as of educationists and social workers. It has already called three Conferences—viz., the Caxton Hall Conference of Hospital Matrons on the Feeding of Nurses, 1910, and the Guildhall School Conferences on Diet, Cookery, Hygiene, 1912 and 1913. Its interest in the problem of the teeth is not new, as its early reports testify. Indeed, its work for oral hygiene was acknowledged by an invitation to participate in the ill-fated International Dental Congress of August, 1914. During the recent railway strike Miss Florence Petty, better known as "The Pudding Lady," the senior member of our lecturing staff, was by special request engaged in giving a series of talks on "The Care of the Teeth" to women's institutes in Kesteven, Lincs.

PLANS FOR THE FUTURE.—Next year's Conference may well prove the first of a series, and might be followed by another on rickets, upon which so much attention is concentrated here and in the famine areas of Europe. The date will be determined by the Executive Committee. May seems a likely time.

With a view to working up interest in the Conference, securing adequate representation, and organising local campaigns, it is proposed to form committees in various cities.¹ A start has been made in Birmingham. Invitations will

¹ Shortness of time rendered this impossible. It is hoped, however, that such committees will be formed to carry out local campaigns.—Ed.

be issued on a large scale. The programme will be framed on the broadest lines, and it is proposed to arrange an exhibition.

In various ways, and especially through the publication of a volume on the lines of *Our Children's Health at Home and at School* and *Rearing an Imperial Race*, which contain the reports of the Guildhall School Conferences with much besides, and have attained to the dignity of standard works, a widespread and, it may be hoped, a permanent effect will be produced.

Dr. James Niven (Medical Officer of Health, Manchester), moved :—

“That this meeting, profoundly impressed with the urgency of the question, welcomes the suggestion that a United Kingdom¹ Conference on the Preservation of the Teeth should be held next year.”

THE M.O.H.'s SUPPORT.—The importance of sound teeth in promoting the nutrition of young children and in saving them from much misery and ill-health, is a matter of common knowledge. It is also recognised that the teeth play an important part in the health of the pregnant woman, and presumably in the development of her offspring. They are, moreover, a vital factor in health generally, and a Conference on the subject in Manchester ought to do much good.

A TEACHER'S IMPRESSIONS.—Miss Alice M. Jackson (Vice-Principal, Manchester Day Training College), seconded the resolution: My work brings me into contact with young children in the elementary schools, and I constantly come upon cases of disgraceful neglect of the teeth. We often have little children coming to school with toothache. Mothers do not know the value of dental clinics, and it is extremely difficult to persuade them to send their children to them, even though the treatment is provided free. I am also frequently astonished to find young women entering our college at the age of eighteen with very defective teeth, while in one or two cases they have lost *all* their natural

¹ In view of the high railway fares, invitations were confined to England and Wales.—Ed.

teeth. Such a Conference is most desirable, and would do much to awaken and educate the public.

A GOLDEN OPPORTUNITY.—Mr. T. C. Horsfall, in supporting :—The suggested Conference comes at the most favourable moment, and will be one of the most important ever held in this country, if we have the full help of the newspaper press and of people already interested in education. It will now be possible for the first time to keep young people under educational influence until they reach years of discretion. We have failed hitherto mainly because, after spending millions of money on the education of young children, we have been so foolish as to allow them to pass away from educational influences at the age of thirteen or fourteen.

There is one city at least in Europe where life has been raised to a much higher level, through a system such as Mr. Fisher's Act will enable us to create. A very great increase in happiness and a great improvement in the mental and physical condition and general welfare of the children in Munich have resulted from the introduction of carefully chosen manual training, and from keeping young people under good educational influences. The official reports by Dr. Kerschensteiner, Director of Education in Munich, who introduced it, make one sometimes think that he is describing children in fairyland. It ought to be one of the chief objects of the proposed congress to devise a system of using the new educational powers for the promotion of physical health as well as of mental improvement. Undoubtedly we shall have the willing help of a great proportion of our teachers. If we can direct the thoughts of the whole community to the possibilities of the situation, we shall have done something for the promotion of a civilisation in the large manufacturing towns such as we have never before known.

An uninvited member of the audience at this stage addressed the meeting, contending that tea drinking was responsible for the loss of teeth so early in life.

The Acting Chairman: I am sure that the meeting would wish me to express our great indebtedness to Miss

Jackson, Dr. Niven, and Mr. Horsfall for their helpful remarks, as well as to the Lord Mayor and Lady Mayoress.

EXECUTIVE COMMITTEE.—The following were appointed, subject to their consent, an Executive Committee, with power to add to their number, for the purpose of organising the Conference: Councillor Margaret Ashton, M.A., Miss Alice Behrens, Sir E. Tootal Broadhurst, Bart.;* Mrs. H. Ashburner, Miss H. K. Armitage, Mr. George Campion, L.D.S., Dr. Douglas Drummond, Mrs. Walter Beer,* Mr. H. A. Caldwell,* Mr. T. C. Horsfall, Mr. D. Headridge, L.D.S., Mr. Edgar Houghton, L.D.S., Dr. Charles Melland, Dr. A. A. Mumford, Dr. James Niven, Dr. W. S. McClure, Mr. Hilditch Mathews, L.D.S., Mr. T. Lomax, Mr. H. W. Norman, L.D.S., Sir W. Milligan, M.D., Sir W. Thorburn, M.D., Miss M. Lennard, Mr. J. N. Gibbons, L.D.S., Mr. William Thomson, F.C.S., Alderman Jackson, Dr. Brown Ritchie, Dr. D. P. Sutherland, Mr. Spurley Hey,* Miss M. FitzGerald, Miss E. J. Ross, Miss Norah Teale.

It was decided to hold the first meeting on December 3rd, 1919, at 2.30 p.m.¹

The members of the General Committee were subsequently entertained at tea by the Lady Mayoress.

* Those indicated by an asterisk were unable to serve.

¹ By kind permission of the Chairman this and succeeding meetings were held in the Committee Room at the Public Health Offices of the Corporation.

FOOD EDUCATION SOCIETY.

EDUCATION COMMITTEE.—Harry Campbell, M.D., F.R.C.P., Chairman; A. E. Baker, L.D.S., School Dentists' Society; H. Beckett-Overy, M.D., F.R.C.S.; H. Charles Cameron, M.D., M.A., F.R.C.P.; Miss Gladys Clarke, Association of Teachers of Domestic Subjects; Mrs. Denne; David Forsyth, D.Sc., M.D., F.R.C.P., F.R.C.S.; A. B. Hawkes, L.D.S.; T. N. Kelynack, M.D., M.R.C.P., J.P.; Miss Florence Petty, M.C.A.; J. Sim Wallace, D.Sc., M.D., L.D.S., British Dental Association; Harold Waller, M.B., B.C., M.R.C.S.

OFFICERS.—H. Beckett-Overy, M.D., F.R.C.S., Chairman; Harry Campbell, M.D., F.R.C.P., Vice-Chairman; Sybil, Viscountess Rhondda, D.B.E., Treasurer; Miss Florence Petty, M.C.A., Assistant Treasurer; Miss N. O'Meara, Assistant Secretary; Charles E. Hecht, M.A., M.C.A., Hon. Secretary.

OFFICES: Danes Inn House, 265, Strand, London, W.C.2.

(B) PROCEEDINGS OF THE MANCHESTER CONFERENCE

A CONFERENCE ON THE PREVENTION OF DISEASES OF THE TEETH, HELD UNDER THE AUSPICES OF THE FOOD EDUCATION SOCIETY, LATE NATIONAL FOOD REFORM ASSOCIATION, AT THE ALBERT HALL, PETER STREET, MANCHESTER, ON THURSDAY, FRIDAY, AND SATURDAY, MAY 13TH, 14TH, AND 15TH, 1920.

THURSDAY, MAY 13TH.

MORNING SESSION.

APOLOGIES.—Sir WILLIAM MILLIGAN, M.D., who presided, called upon Mr. Charles E. Hecht, hon. secretary, to read letters of apology as follows:—

The President, Board of Education, the Rt. Hon. H. A. L. Fisher, P.C., M.P.; the Minister of Health, the Rt. Hon. Christopher Addison, P.C., M.P., M.D.; the Parliamentary Secretary, Ministry of Health, Viscount Astor; the Chief Medical Officer, Ministry of Health and Board of Education,

Sir George Newman, K.C.B., M.D. ; the Chief Inspector, Reformatory and Industrial Schools, Home Office, A. H. Norris, M.D. ; the Vice-Chancellor, University of Sheffield, Sir Henry Hadow, M.A., Mus.D. ; the Rt. Hon. J. R. Clynes, P.C., M.P. ; Sir William Thorburn, K.B.E., C.B., C.M.G., M.D. ; the Medical Secretary, British Medical Association, Alfred Cox, M.D. ; the Chairman, Food Education Society, H. Beckett-Overy, M.D. ; the President, British Dental Association, Montagu Hopson,¹ L.D.S., R.C.S.; the Chairman, Representative Council, British Dental Association, Norman Bennett, L.D.S. ; the President, London Branch, British Dental Association, C. Peyton Baly, L.D.S. ; the Medical Officer of Health, John Robertson, M.D. ; and the School Medical Officer, G. A. Auden, M.A., M.D., Birmingham ; the Senior Medical Officer, Nottingham, E. M. Wyche, D.P.H. ; the Medical Officer of Health and School Medical Officer, Eastbourne, W. G. Willoughby, M.D. ; H. Charles Cameron, M.A., M.D., Guy's Hospital ; W. A. Potts, M.D., Birmingham ; Montague Dixon, M.D., Melton Mowbray ; Councillor Percival T. Leigh, L.D.S., Leeds ; Miss Sara Burstall, Manchester High School for Girls ; Mrs. Lamartine Yates, L.C.C. ; Mrs. Eckhard ; Mrs. H. H. House, Malvern College ; Cecil Reddie, B.Sc., Abbotsholme School ; Miss Harriet P. Moore,² Superintendent, Blackburn District Nursing Association, and others.

It was stated that the Medical Department of the Board of Education had expressed interest in the programme, and that Dr. Ralph Crowley was attending from that Department.

A MANCHESTER WELCOME.—Sir WILLIAM MILLIGAN : Allow me to offer you a hearty welcome to Manchester and to express the hope that this Conference may be a great success, and that the result of your labours may add some factor to the general sum of human knowledge. Manchester is a city which is very wide awake. It is a great industrial and intellectual centre, always receptive of new ideas, and ready to put into practice any which are for the good of the human race.

¹ Mr. Hopson wrote:—The programme is excellent. I feel sure that the Conference will be a great success.

² Miss Moore wrote:—Anything we can do, as public workers, to prevent decay of teeth, is indeed worth while.

JOHN BULL AND HIS DIET.—We cannot claim that our teeth are one of our most valuable assets. Indeed, I would go to the length of saying that the teeth of the British people are in a deplorable condition, and that there is much need for a thorough overhauling of the dentures of every one of us. As the outcome of this conference, I trust that it may be found possible to improve the teeth of the coming generation. John Bull may be a brainy individual, or he may be a beefy individual, but at any rate he cannot claim to have been brought up upon a scientific or hygienic diet.

THE NEGLECT OF DENTAL GYMNASTICS.—There are two factors which must ever be present to our minds when we are considering the teeth of the human race. The one is the influence of diet upon the development and the pathological condition of our teeth, and the other, you will perhaps allow me to call, suitable dental gymnastics.

We, as a race, have been brought up largely upon sloppy and soft food, with an excessive amount of carbohydrates. It is, therefore, little wonder that dental caries and pyorrhœa are almost indigenous. If we had been taught from our infancy upwards to use our muscles of mastication it would have been a great factor in the production of better teeth. It might have been a serious blow to the dental profession, but it would have been a gain to the race.

A LARYNGOLOGIST'S CONFESSION.—As a laryngologist, I have to examine thousands of mouths every year and what strikes me particularly is the rarity with which one finds a good or a complete set of teeth. In fact, it is exceptional to find a good set of teeth in a man or woman of middle age. There must be some great underlying factor which leads to this phenomenon.

JEW AND GENTILE.—If you examine the teeth of the Jewish child and those of the Gentile child, taking large numbers of children from approximately the same areas, there is a marked difference, all in favour of the Jewish child.¹ To

¹ Among the poorer Jews, for the most part dwellers in the slums of London and our other great cities, oil forms a much larger part of the children's diet than among their Christian contemporaries. Everywhere fish fried in oil was the staple of their diet, while among fish, those richest in oil, such as herrings, were chosen by preference and not only for their cheapness. Potatoes were

what is that due? If you take the dietary of the Jewish child you will find that it is brought up on a different class of food, containing a large amount of vitamins, so essential to the preservation of perfect teeth and health.

FAR-REACHING INCIDENCE OF DENTAL DISEASE.—Again, in examinations of the mouth, what impresses me frequently is that oral sepsis is the underlying factor in the incidence of certain diseases of the larynx and of the cervical glands. As an example, take the common condition of enlarged glands in the neck of a child. It is often said that these glands are the result of the presence of enlarged tonsils or adenoids, and this statement is perfectly true; but why do so many children suffer from enlarged or septic tonsils? In a large proportion of cases you will find septic teeth. Unless proper attention is given to the teeth it is of little use removing the bi-products.

POSSIBLE CONNECTION WITH CANCER.—There is another matter that might be discussed by this Conference, and that is the possible relationship of septic teeth to malignant disease in the mouth. I see every year a large number of cases of cancerous conditions of the floor of the mouth, of the upper orifice of the larynx and of the hypo-pharynx, where there is at the same time a septic condition of the floor of the mouth. Is it possible that this septic state is, in some way or other, the exciting factor in the ultimate production of the cancerous condition?

SYBIL, LADY RHONDDA.—I have now the pleasure of inviting our distinguished guest, Lady Rhondda, to open the Conference. You all know who she is and what she has done. You know that she is the widow of a distinguished statesman, who gave his life and his services to this country, and to whom the nation owes a great deal.

SYBIL, VISCOUNTESS RHONDDA, D.B.E. (who was received seldom boiled in water, but generally in milk, and every opportunity was seized to mingle fat of some kind with the children's food—a practice which is the more difficult, in that the consumption of bacon or pork is forbidden by the Jewish law. As the result, rickets is practically unknown among Jewish children, the proportion being something like one-eighth of its prevalence among the Gentiles.—Dr. William Hall cited in the *Illustrated London News*, May 1st, 1920.—Ed.

with applause) : It gives me great pleasure to help in a small way by opening this Conference which is going to do immense good. It is not so much the number of people who are taking part, as those who will hear about it afterwards.

Anything that will help us to get rid of the dentists will be a great blessing. (Laughter.) Having to go to the dentist is very disagreeable. One is always afraid of being hurt. You are not always hurt, but the anticipation is far worse than the reality. If this Conference will help us to do away with dentists, it will be a notable achievement.

Again, children should be educated to eat up their crusts. Even in one's own household, maids will cut the crusts off bread when making pies. We have no right to throw away crusts.

I now have much pleasure in declaring this Conference open.

INAUGURAL ADDRESS.

By J. G. ADAMI, M.D., F.R.S.

Vice-Chancellor, University of Liverpool.

APPARENT OPPOSITION.—Dr. Harry Campbell's main thesis and, indeed, the main object of the Food Education Society, is apparently to train the people in the proper care of the mouth, so that eventually the dentist will become a luxury in the land. It may seem that what I am about to say exactly controverts this thesis, for I propose a better training and a great increase in the number of dentists. I am, however, far from being in opposition to Dr. Harry Campbell. What I urge is that there has to be this increase before a decrease can be obtained. More particularly is this essential if the national service of dental inspection in the schools is to be adequately performed. These inspectors will be the missionaries who will guide and direct the rising generation in the care of their teeth, and warn them against the ever-present dangers.

A NOTABLE SAYING.—I want to take for my text certain words of a very dear friend of mine, the greatest physician of our generation, the late Sir William Osler. "You have got," said he, "to preach it early and late. It is the gospel of the cleanliness of the mouth, cleanliness of the teeth, and

cleanliness of the throat. There is not a single thing more important to the public in the whole range of hygiene than that. It is a matter of really national importance."

With that gospel I am wholly in agreement. May I put before you certain aspects of the matter that claimed my attention when I came back to England in 1915 as a member of the staff of our Canadian Army Medical Corps ?

"A GHASTLY SERIES OF DECAYING FANGS."—In wandering through London streets and English towns and villages, a profound impression was made upon me by the extraordinary amount of evidence on every hand of the wretched state of most people's mouths. Men and women had only to smile to exhibit what, compared with my experience in Canada, was a perfectly ghastly series of decaying fangs. Gaps where good teeth should have been, and front teeth irregular, discoloured, eroded, and evidently utterly uncared for.

"THE VARIEGATED GOLDEN SMILE."—I do not wholly like the variegated golden smile that too often confronts one over in America. Still, the abundant evidence there of filling and crown and bridge work does at least show that care has been taken. It is quite possible also that, being more nervous and highly strung, those of the North American continent are forced by mere physical agony to go to the dentist, whereas we more phlegmatic Britons can have our teeth worn away with disease without being specially disturbed. Here the mass of the population take little or no care of their teeth, and sooner or later this must have its inevitable result in impaired general health.

CANADIAN DENTAL SERVICE.—Coming to the Army, I found the same wretched state of affairs. We in our Canadian Forces, from the very beginning of the war, had a dental officer attached to every battalion and a dental department in every hospital, even as far forward as casualty clearing stations. Presently we had an established dental service, with an independent director, and parallel with the Army medical service. This brought about certain difficulties, but the principle was right and, as a result, the health and well-being of the Canadian Expeditionary Force was markedly raised.

WAR OFFICE ATTITUDE.—The authorities at the War Office were obstinate and reactionary to the last degree. Dentists were needed urgently, yet they were allowed to go into the ranks as combatants. The number of dentists overseas was lamentably insufficient—one to each division. One had only to observe the way in which, wherever there was a Canadian dental hospital and clinic, British soldiers, from generals down to buglers, poured in to obtain treatment. I might even say from kings downwards, for in Salonika the King of Serbia and his staff claimed the services of the dental officers of No. 4 Canadian General Hospital, and His Majesty was so relieved that he distributed war decorations lavishly, even down to the orderlies attached to the clinic.

SOME CANADIAN STATISTICS.—Officers of the Canadian Army Dental Corps, from its establishment in July, 1915, to June 30th, 1919, in England and France, accomplished over a million fillings, provided 173,000 dentures, carried out over half a million extractions, and gave altogether two and a half million treatments. This was exclusive of the large amount of work accomplished in France and Salonika by other dental officers directly attached to the Canadian Army Medical Corps. Yet the sum total of the Canadian Expeditionary Force was little over 400,000 men. In the Royal Army Medical Corps the organisation of the dental service was so imperfect that statistics could not be, and have not been, provided.

STATE OF THE DENTAL PROFESSION.—The third impression made upon me when inquiring into the apparent remissness of the War Office during the first three years of the war was the practically hopeless state of the dental profession. The Army could not act, because it could not accept unlicensed practitioners without proper qualifications as officers, and because of the utter futility of the Dentists Act of 1878. There was nothing like a sufficiency of qualified dentists to form either an independent dental service, or a dental annexe to the R.A.M.C.

SECRETS OF THE REGISTER.—By the Dentists Act of 1878 an official register of qualified dentists was established. That for 1917 contained 5,500 men, of whom 1,344 had registered

as being in practice before 1878, and must therefore have been over sixty years of age. Of the remainder 500 practised in Ireland or abroad. The total number of active and properly qualified dentists of all ages for England, Scotland and Wales was only 3,650—about 1 for every 15,000 inhabitants. Of these 880 were serving in the Army as Army dentists, or as combatant officers, or in the ranks.

GOVERNMENT METHODS.—In 1918, the next year, there were 13,000 dentists in the Army. A dental tribunal had been appointed by the Government, which had drawn out these extra hundreds of dentists for service in the year before the end of the war. Even then they were being employed under medical men with no dental knowledge, and the proffered service of first-class dentists was time and again declined. Only in the last year of the war was there a belated recognition of the value of a dental service in the Army, and as a result the country was completely drained.

SHORTAGE OF DENTISTS.—The state of England, with these dental officers returned, is such that if every man under sixty on the register had 4,000 names on his books, only 20,000,000 of our 45,000,000 of population could be treated by qualified dentists. As a matter of fact, 1,000 patients give full employment to the careful and conscientious dentist.

FATE OF THE MAJORITY.—The qualified dentist can and does only deal with the middle and higher classes. The teeth of the vast bulk of our artisan and labouring population are either wholly uncared for or are treated by men not on the register, who have had no proper preliminary education nor expert teaching, save by other unqualified dentists. They have possibly learned the technical matters of extraction and filling, but have had absolutely no training in the underlying medical aspects of the profession. In short, they do not know their work and are simply hack operatives, with nothing to show that they are any more fit to deal with the teeth of the population than were the old quack dentists who, a century or more ago, attended fairs with an assistant and a band, or it might be only a drum, and extracted teeth with music to drown the noise.

DENTISTS ACT, 1878.—In the matter of dentistry England,

to her shame, is a generation behind the United States and Canada, and this all because of the futile Act of 1878. While establishing an officially recognised and registered dental profession, the Act put it under the charge of the General Medical Council, without proper representation on that body, and as its President, Sir Donald Macalister, with perfect frankness admitted last year to the Departmental Committee, the Council did little to advance the interests of the profession. It was too busy with other things.

CONSEQUENCES.—Though the Act placed a large number of unqualified men with no diploma on the register—men who had been established in practice for a number of years—it expressly permitted unqualified practitioners to carry on, provided they did not call themselves dentists or dental surgeons. They could announce themselves as “Professor Puller’s American Dentistry” or “Grinder’s Dental Parlours,” or “X. Traction and Company’s Painless Dentistry.” You can see similar notices in the principal streets of all our Lancashire towns. The status of the properly qualified dentist is also lowered in the popular opinion through this wretched state of affairs. Your ordinary citizen knows nothing about the precise terms and definitions of the Act of 1878, and his mind mingles together and confuses the dentist proper and the unlicensed practitioner.

COST OF MEDICAL AND DENTAL TRAINING CONTRASTED.—What has been the result? The course for a proper diploma in dentistry is long and costly, more costly than that for a diploma in medicine. This is so of necessity. A physician or surgeon can afford to give his services to a medical school for, at most, a nominal remuneration, knowing that his reward will come after not too many days. His pupils will sound his praises and will send him a succession of patients. No dentists send their cases for treatment to other dentists. Thus there is little teaching of dentistry for the love of teaching, and instruction has to be paid for.

HOW THE UNQUALIFIED MAN LEARNS HIS TRADE.—So considerable a proportion of dentistry is of a routine order—extraction of teeth, filling of cavities, and supplying dentures—that the beginner can learn how to extract in a few days.

He can also purchase and fit the same artificial teeth as the qualified man, and even learn how to make and fit an ordinary plate in a few months. A year's apprenticeship to an unqualified man will make him as good, or as bad, a practitioner as his master, and as matters stand equally able to make a comfortable living. He has had no expenses over his education—he may have been a farrier, or a hospital orderly, or a plumber's assistant, and can establish himself in a cheap practice. The properly qualified man, after a costly education extending over four or five years at a University dental department, cannot afford to take up such a practice, and finds his unqualified contemporary married and with a family and a pony "shay" when he at last is painfully beginning to receive a rare patient.

SOME STARTLING FIGURES.—Is it a wonder that the majority of dental practitioners in this country are unqualified? Some parts are worse than others. Let us take first some neighbouring boroughs and divisions. According to the report of the Departmental Committee, Bolton, with a population of 168,000, possesses 13 qualified to 80 unqualified men. Huddersfield, with a population of 193,000, possesses 7 qualified and over 100 unqualified men. Rochdale (population 83,000), 3 qualified and at least 20 unqualified men. Going a little further afield, the county borough of East Ham (population 133,000) has not a single qualified man in the area, while West Ham (population 289,000) has only 2.

It may interest Lady Rhondda to know that the Rhondda Urban District (population 114,000: some claim 118,000) also does not possess a single qualified man.

MORE ABOUT THE UNQUALIFIED MAN.—Now these unqualified men have had no training in anatomy; they know nothing about the finer structure and development of the teeth, of the physiology of the mouth, and of digestion. Bacteriology is to them a closed book, the nature and properties of dis-infectants are unknown to them save by a rule of thumb. They have no knowledge of the science of dentistry. These men are mere individualistic money-makers; not out to serve the public, but to make a comfortable livelihood. They have no professional spirit; they cannot have it, because they have had no corporate training. It is not to

their interest to instruct their clients to keep their mouths in a healthy and clean state ; the more caries, the more work there is for them to do. So we have this ghastly procession of men and women not merely disfigured by rotting teeth, but lowered, if not ruined, in health and digestion.

RECRUITING STATISTICS.—As to the extent of the mischief let me quote from some statistics. During the war dental condition was not regarded as a bar to enlistment or conscription, so that the state of the teeth of recruits is a fair index of the mouth condition of the population at large.

“ In the Scottish Command it is estimated that 44 per cent. of the men are dentally unfit—*i.e.*, they lack the minimum of dental efficiency which will ensure effective mastication of food.

In the Western Command, from April, 1917, to March, 1918, between 80 and 90 per cent. of the recruits were in need of dental treatment. (Recruits aged 18–19, 83 per cent. ; recruits aged 19 to 44, 93 per cent.)

“ In the Northern Command 84 per cent. of the recruits, aged 19–24, were suffering from decayed teeth. In the general population it was found that the condition of the teeth of the women was worse even than that of the men.”

The Inspector of Dental Service of the Northern Command further directed the special inspection of 1,800 recruits, with a view to examination of dental defects in age groups. From 19 to 24 just under 5 per cent., or only 1 out of every 20, had all the teeth in a sound condition. In the same age period 84 out of 100 of the men examined had decayed teeth. The average number of decayed teeth per man was 7·3. The Committee were of opinion that the state of affairs revealed should receive early attention, with a view to the improvement of the health of the nation and an increase in industrial efficiency.

A PIONEER'S TEACHING.—I have no time to discuss the relationship that exists between foul and ulcerated mouths and the development of chronic disease of other parts of the body. It is a matter that I brought forward so long ago as 1899, and as a pioneer I am delighted to see my teaching at last bearing fruit. I took up the matter generally, pointing out that chronic inflammation of any mucous surface by

micro-organisms of low virulence is followed immediately by the absorption of the bacteria into the system, and that although for a long period the tissues could destroy these bacteria, eventually the former became exhausted. As a result chronic fibroid diseases of various organs resulted, with destruction of the essential cells (diseases, for example, of the rheumatoid type). It was my old friend and colleague at Cambridge, Dr. William Hunter, who independently, a little later, called special attention to the mouth as the portal of entry for such germs. Sometimes I am a little fearful lest to-day we are not laying too great a stress upon mouth conditions as the source of these evils, to the exclusion of the other channels of entry of the bacteria which set up low recurrent infections and chronic subinfection. Yet I have no doubt that the mouth is a frequent source.

HOW ARMY TOOTHBRUSHES WERE USED.—The state of affairs found in recruits just quoted supports this conclusion. The majority had never used a toothbrush, and the Army did not do much to improve matters. They made it compulsory that every man should be provided with one, but what is a toothbrush to a man who has not been accustomed to use it, unless a certain ritual be established? There was no supply of dental soap or other preparation that could be carried in the knapsack. As a consequence a toothbrush was generally used for cleaning the finer parts of the man's shooting iron and for other odd jobs.

TASK BEFORE THE NATION.—What, however, I wish especially to bring before you is the frightful dearth of properly trained dentists, the need that this be remedied, and the means that must be taken. The regulations regarding the inspection and care of the teeth of school children, of nursing mothers, of those coming under the Insurance Act, make it the more urgent that the number of fully qualified dentists should be rapidly and greatly increased. The Government cannot possibly place such cases in the hands of the untrained and the unqualified. During the next few years the number of qualified dentists must be doubled and more than doubled; 5,000 at least must be added to the register. We could find work and a good livelihood for 10,000.

A SUGGESTED SOLUTION.—How is this to be done? I understand that Sir George Newman and the Ministry of Health have ready for Parliament a new Dental Act. This much is certain. The old futile Act of 1878 must be wiped off the statute book. The time has come for unqualified practice to be relegated to the limbo of the past, without injustice to those who were permitted to ply their trade. Those established in practice for more than, say, seven years must be placed on the register; their livelihood cannot be destroyed. Those of less than seven years' practice and still young must be given time to prepare for an examination which shall demonstrate their fitness to be placed on the register. Those of less than one year's practice must either withdraw from the profession, or take a full course leading to the diploma. After the passing of the Act no one shall be permitted to accept fees for dental work of any order unless he or she be upon the register.

PART OF THE UNIVERSITIES.—In Manchester, while the Dental College is close to the University, it is not, I understand, an integral part of it. In Liverpool we have for some years recognised the need of helping forward the dental profession, and give University degrees in dental science. We have a right to look to the Universities to take the lead in raising the status of the profession, and making provision for a proper supply of duly qualified men. That means additional laboratories and educational facilities of the first order. Both Manchester and Liverpool are appealing for funds for their Universities. The funds, so far announced, are not sufficient to cover their pressing demands. It is right that part should go to the development of dental education. Unfortunately the amount so far collected is already largely ear-marked for other purposes. I only hope that the report in this morning's *Manchester Guardian* is true, and that the Chancellor of the Exchequer will henceforth admit sums granted by those in industry for scientific and educational purposes to count as ordinary trade expenses and so be exempt from income tax. In that event we shall see a material increase in the money donated for University purposes. Our Universities can then do their duty to the nation in promoting the efficiency of the dental profession.

WHY THE FOOD EDUCATION SOCIETY IS NEEDED.—Dr. HARRY CAMPBELL, Vice-Chairman, Food Education Society: In the unavoidable absence of Dr. Beckett-Overy, Chairman of the Food Education Society, it is my privilege to move a vote of thanks to Lady Rhondda, who has so graciously come all the way from London to open this Conference, and to Professor Adami for his most interesting address.

I would take the opportunity of telling you that the Food Education Society¹ has no fads, no eccentric fancies in the matter of diet. Our object is to discover what is the best kind for the community and to put the public in possession of useful knowledge.

The British, in my humble opinion, are the worst-fed people in the world, and an incalculable amount of disease could be prevented if they were fed on proper lines.

A WORLD WITHOUT DENTISTS.—Chief among the many evils resulting are diseases of the teeth, about which Sir William Milligan and Professor Adami have spoken. Personally, I am not greatly interested in the questions which Professor Adami has raised. I am not concerned about increasing the number of dentists. I really do not care much about his dentists! What I want to see is the prevention of dental disease, and that is what we are out for. Professor Adami wants to multiply our dentists. I want to reduce them to a minimum. We are convinced that nine-tenths of dental disease is preventable. The object of this congress is to instruct the public how they can reduce diseases of the teeth by nine-tenths.

AN APPEAL.—I am asked to mention that the expenses of this Conference are heavy,² and that our Society is in great need of funds and more annual subscribers. You will permit me to add that Lady Rhondda, our treasurer, will be willing to receive both donations and subscriptions.

A MEDICAL OFFICER'S TESTIMONY.—Dr. W. ST. C. McCLURE,

¹ Reports for the Period of the War, 1914-1918, 1s., and for 1919-1920, 6d., may be had from the Food Education Society, Danes Inn House, 265, Strand, W.C.2.—Ed.

² The total cost, apart from this volume, amounted to £235. To meet this, the Society had to make serious inroads on its slender resources. See Report, 1919-20, 6d.—Ed.

Deputy Medical Officer of Health, Manchester, and Chairman Local Committee, in seconding said: The subject under consideration is one of the most important, if not the most important, with which we are called upon to deal. The causes of dental decay are fundamental. They lead not only to decay of the teeth, but to malnutrition, to rickets, with its dire consequences, and to other diseases which account for the wreckage of so many human lives. Our object is twofold. In the first place to make sure of what we know, and in the second place to determine what means and methods shall be adopted to apply our knowledge. We are much gratified at having Lady Rhondda here to help us. Her presence, in itself, is a sufficient guarantee of the importance of the subject.

The vote of thanks was carried with acclamation.

SYBIL, VISCOUNTESS RHONDDA: Thank you very much indeed for your vote of thanks. It has been a great pleasure to meet you all and to hear Dr. Adami's excellent address. We do not want, however, to do away with the dentists at once.

I would endorse Dr. Harry Campbell's appeal for financial support. The donations towards the expenses of this Conference given by members of the General Committee encourage us greatly.

THE FIRST STEP.—Professor ADAMI: I feel strongly that if the dental condition of our children and of our population is to be improved it must be through the development of a proper national dental service, with inspectors, whose duty it is to inspect the teeth of school children regularly; to advise, to act as missionaries, educating the people in preventive measures.

I am not in the least afraid of Dr. Harry Campbell's suggestion about doing away with dentists, provided that these steps are first taken.

THE EXTENT AND CONSEQUENCES OF DENTAL DISEASE.

By HARRY CAMPBELL, M.D.

IMPORTANCE OF THE CONFERENCE.—To many this congress may not appear an event of much importance. It is not largely attended, nor likely to create any particular stir in the world. Nevertheless, exaggerated as the statement may seem, I doubt if a subject of greater importance than the one we have met to discuss is ever likely to be brought to the notice of the people of Manchester.

HEALTH FIRST AND FOREMOST.—It concerns the health of the people, and health is the primary concern of us all. Given a healthy people, duly disciplined on sound educational lines and blessed with a representative Government, and you have a state of things as near perfection as you are likely to get in this somewhat difficult world of ours. And the greatest of these desiderata is health.

FOOD BASIS OF HEALTH.—Just as sound health is the supreme need of our community, so is proper food the prime requisite of health ; and the object of this Society is to teach the people what proper food is. Perhaps the greatest reform needed is the reform of our faulty dietetic customs. I am never tired of insisting that the British are the worst fed people in the world.

A GRAVE INDICTMENT.—One of the consequences of this is the shocking state of our teeth : we have the worst teeth of any nation. There are many other evil consequences, so many indeed and so grave that it would be difficult to exaggerate the good which would accrue from adequate dietetic reforms.

The state of our teeth is as bad as it well could be. You have already heard something about it from Professor Adami. It beggars description. It is horrible. It is a national disgrace. It should excite in us a feeling of shame and humiliation and a fixed determination to mend our ways and remedy the evil, for it can be remedied.

A REPROACH TO CIVILISATION.—Savages, whom we are so apt

to despise, have sound teeth and take a pride in keeping them sound. They would turn away in disgust if they could look into mouths which I am often compelled to examine, for it would be difficult to imagine a more loathsome sight. The poorest Hindoo mendicant, when he begs for a morsel of food, asks for water with which to rinse his mouth. It is a part of his religion to have sound, clean teeth : to have bad teeth is for him a mark of degradation from which he shrinks.

CHANGED ATTITUDE REQUIRED.—We must rouse our people from this indifference to the state of their teeth. The child, from the earliest years, should learn to take a pride in his teeth. He should be made to realise that beautiful teeth are an adornment, that sound teeth are useful servants requiring consideration and care. He should be taught that even the loss of a single tooth, which many a schoolboy would willingly part with on the chance of getting a half-holiday, is no light affair. This casual, off-hand attitude is not the one that should be adopted to a friend capable of rendering good service to the end of life. When a person loses a tooth, rather would I have him retire sorrowfully to the solitude of his chamber, draw down the blinds and read the Burial Service over it !

Diseases of the teeth include :—

1. Irregularities, due for the most part to deformity of the jaws.
2. Loss of teeth from extraction and shedding.
3. Decay of the teeth.
4. Disease of the fang tips.
5. *Pyorrhœa alveolaris*, or, as we may term it, “socket disease.”

I. EXTENT OF THE TEETH DISEASES.

1. DENTAL IRREGULARITIES.—Irregular teeth are, for the most part, due to misshapen jaws. There are more misshapen jaws among us than among any other people. Indeed, a normally developed adult British jaw is a rarity. Yet, unless the jaws are properly developed, it is not possible to get a perfectly normal arrangement of the teeth, admitting of

a correct apposition of the upper and lower teeth, *i.e.*, a perfectly even bite.

2. LOSS OF TEETH.—(a) By extraction. I am unable to tell you, within a few millions, how many teeth have been wrenched from the jaws of our present population. I should say about a hundred millions. If we suppose that one-half have been extracted without an anæsthetic, we get a horrible total of human suffering. Fifty million wrenches !

(b) By shedding. It is natural for the temporary teeth to fall out, and most people, if they live to be very old, shed all their so-called permanent teeth. With every year, after thirty, the number of these teeth which fall out increases, so that in old age the gums are generally toothless.

We have come to regard this shedding of the teeth with advancing years as a natural process. This is an erroneous view. The spontaneous shedding of the permanent teeth is always due to disease, generally in the shape of pyorrhœa alveolaris. If the sockets remain healthy, the teeth, far from loosening, tend to get more and more firmly fixed within them.

Among our present population at least a hundred million teeth have been shed owing to socket disease, the result mainly of faulty dietetic customs.

3. DECAY OF THE TEETH.—Caries may affect both the temporary and permanent teeth. It is estimated that less than 1 per cent. of our children pass through their first dentition without suffering from this disease. Under proper conditions caries of the temporary teeth would be practically unknown. Such early decay, if extensive, may have a serious influence on the child's future.

As to the number of decayed permanent teeth among us, there is little doubt that it exceeds two hundred millions, even if we leave out of account those extracted and spontaneously shed.

4. DISEASE OF THE ROOTS OF THE TEETH.—The inflammation resulting from dental decay may spread to the tip of the fangs and thus lead to abscess. This, when it burrows its way externally through the socket wall, constitutes a gumboil. There must be some twenty million cases of fang disease of this kind among us.

5. PYORRHŒA ALVEOLARIS.—Nearly all our countrymen suffer from some degree of pyorrhœa alveolaris, or socket

disease, after the age of thirty—many even before the twentieth year. This disease is responsible for the spontaneous shedding of the teeth. There are upwards of two hundred million diseased sockets among the inhabitants of these isles.

Summing up the extent of dental disease, we find :—

Dental irregularities are practically universal. Some hundred million teeth have been extracted. About the same number have been spontaneously shed. There are some two hundred million decayed teeth ; about the same number of pyorrhœaic sockets ; and some twenty millions of diseased fang tips. A proud record !

AT LEAST NINE-TENTHS OF THIS DISEASE IS PREVENTABLE.—
It is our business to show the people the means of prevention.

II. CONSEQUENCES.

These may be considered under the following headings :—

1. Malodorous Breath.
2. Unsightliness.
3. Pain.
4. Reflex Disturbances.
5. Defective Mastication.
6. Secondary local disease.
7. Blood poisoning.
8. Economic loss.

1. MALODOROUS BREATH.—This may be caused by decay of the teeth, but even more, perhaps, by pyorrhœa alveolaris.

2. UNSIGHTLINESS.—Beautiful teeth are an adornment ; they are more beautifying than the most beautiful clothes. On the other hand, irregular and diseased teeth are unsightly and spoil an otherwise comely face. This truth is to some extent recognised by the better educated, but it is largely ignored by the poorer classes. If a girl visiting my out-patient department has good teeth, I never lose an opportunity of urging her to take care of them and to take pride in them. I try to make her understand that not the most beautiful hat money can buy will become her half so well as her pretty teeth. It is quite common to see in young women of this class abundant commencing decay, as to which they seem to be utterly indifferent. Yet, sooner or later, they

have to submit to the expense, trouble, inconvenience and unsightliness of artificial teeth, for it is idle to pretend that artificial dentures (especially in the case of young people) do not detract from the beauty of the human countenance. Many, especially women, take to wearing false teeth as a matter of course.¹ Surprising as it may seem, they are sometimes actually proud of them and take every opportunity of displaying them to full advantage. Such was the case with a hospital patient of mine, a girl of fifteen summers. Her mother, she informed me, had sold a pig to provide her with false teeth, a circumstance which greatly added to her self-importance.

Teeth may be unsightly on account of :—

Decay.

Irregularity.

Excessive length.

Irregularities of the teeth are mainly due to misshapen jaws, which do not allow the teeth to take up their proper positions. Certain of these malformations are admittedly the consequence of unavoidable defects of development (as in cases in which the upper jaw projects considerably beyond the lower jaw). At least nine-tenths of them, however, are acquired—the result, *i.e.*, of preventable causes, causes which have their origin in faulty dietetic customs. The commonest form is the narrow, contracted upper jaw, with disastrously overcrowded teeth.

That kind of unsightliness which results from unduly long teeth is all too common. Three factors contribute to its causation.

FAULTY BITE.—When the teeth do not take up their correct positions in the gums, the upper and lower teeth are not properly opposed so as to press against one another during

¹ The ancient Egyptians had, according to Herodotus, special physicians “for the diseases of the teeth,” and the Romans seem to have been familiar with what most folk probably regard as essentially modern branches of dental practice. A remarkable passage from the Twelve Tables, or Ancient Laws of Rome, quoted by Cicero, mentions those “who eat with their teeth joined with gold,” and Martial darts his shafts of satire at the Roman ladies of fashion who sought to remedy the deficiencies of nature by what he terms “bought teeth,” made of “Indian horn”—*i.e.*, ivory.—*Morning Post*, 1920.—Ed.

mastication. In consequence of this they gradually emerge from their sockets, causing a larger and larger portion to project beyond the gum: an apparent lengthening of the teeth is the result.

PYORRHŒA.—A still more effective cause of this lengthening is that so common disease among us—*pyorrhœa alveolaris*. Here the process continues until the teeth drop out.

DEFECTIVE GRINDING DOWN.—The third factor tending to make the teeth appear long is inadequate mastication. If the teeth are correctly opposed and the food is of a kind compelling adequate mastication, they tend to wear down. This wearing down process tends to produce an even biting surface, the effect of which is to enhance the beauty of the dental curve. Under opposite conditions, the biting surfaces of the teeth are not worn down, and it is possible to tell from this circumstance alone whether a person is an efficient masticator or not.

A NATION LONG IN THE TOOTH.—These three causes of long teeth, singly or combined, operate to a disastrous extent in this country. A large proportion of our adult population are “long in the tooth.” So common is this condition among us that it is looked upon as a national characteristic by foreigners. When a continental cartoonist wishes to portray a Briton he represents him with huge, tusk-like teeth; and this does not make him look attractive.

These long teeth are ugly in themselves; they give the mouth the appearance of being overpacked with teeth; and they distort the shape of the lips by thrusting them outwards, so that often it is only with difficulty that the lips can be made to close over the teeth.

What with our misshapen jaws, our decayed teeth, irregular teeth, long teeth, false teeth, we make a sorry spectacle—one which strikes the observant foreigner directly he reaches our shores, in a way not a little wounding to our national pride. It is this shameful condition of things which it is the object of our congress to correct.

3. PAIN.—The most obtrusive evil resulting from dental disease is pain. Every tooth is provided with a sensory nerve. To those who suffer from toothache this may appear a stupid dispensation. “What good purpose,” they may

feel inclined to ask, "can these nerves serve? Surely teeth do not need to be sensitive?" We may be quite sure that they would not be provided with an elaborate system of nerves, without reason. The purpose is to enable them to feel the food and reject injurious particles, such as pieces of grit. Wearers of complete sets of artificial teeth are bereft of this delicate, discriminating sense.

The pains associated with bad teeth consist of—

- (a) Spontaneous pains, felt in and around the teeth—toothache.
- (b) Referred pains, including neuralgias.
- (c) Pain inflicted by the dentist.
- (d) Emotional pain, in the shape of fear of the dental chair.

CAUSES OF TOOTHACHE.—Toothache may result from dental decay, from inflammation of the tooth socket, or from the condition which culminates in gumboil. I do not need to remind you of the frequency of toothache. At this moment, thousands of men, women and children within our shores are suffering from it. Millions of hours of toothache have been endured by our present population.

"TOOTHACHE IN THE HEAD."—Bad teeth are a potent cause of referred pains, such as neuralgia. They may also produce earache and headache. Sir Lauder Brunton used to express this latter fact by saying that a person might suffer from "toothache in the head."

The pain inflicted by the extraction of a tooth without anæsthesia is as terrible as pain can be. That caused by preparing a tooth for filling, though not so severe, is sufficiently disagreeable.

Finally, there is that most painful emotional state, fear of the dental chair, which is responsible for a great volume of misery.

4. REFLEX DISTURBANCES.—The reflex effects of dental disease are less important than they were once supposed to be. Convulsions and spasm, causing a locking of the jaws, are occasional results.

5. DEFECTIVE MASTICATION.—Dental abnormality, whether the result of disease, absence, or irregularities of the teeth, leads to defective mastication.

WHAT IS MASTICATION ?—Mastication is a lateral movement of the lower teeth against the upper. It is a true grinding, such as is most characteristically seen in herbivorous animals—the cow, the sheep, the horse. A purely vertical compression of the lower teeth against the upper is not mastication, for it does not grind the food, it causes the food to be bitten by the front teeth and pounded by the molars. We may thus speak of this vertical movement as biting or pounding, as distinguished from mastication proper, which is essentially a lateral movement.

DO THE BRITISH PRACTISE IT ?—The British do not masticate their food. Rather do they bite it and suck it : they do not grind it. The pronounced vertical movements of the lower jaw observable in some of our countrymen while eating are by no means beautiful to behold, as when, for instance, it is depressed almost to the limit and brought up in sudden rhythmical snaps. With genuine mastication, there is no need to make this obtrusive downward movement.

CAUSE OF FAILURE.—The reason that the British are such poor masticators is because the food upon which they are brought up does not favour the development of the masticatory instinct. Hence, even in the case of those of us who have fairly good teeth, mastication is generally perfunctory. When the bite is bad, as it so often is, lateral movement is necessarily defective and may, indeed, be practically impossible. Mastication may also be interfered with by dental abnormality, due to absence of teeth, or irregularities.

SOME OF THE CONSEQUENCES.—Deficient mastication leads to many evils. If the jaws are not properly exercised during the years of development, neither they, nor the nasal passages, nor the tongue, nor the salivary glands, develop properly.

Insufficient grinding of the food predisposes to indigestion. It is essentially for the starchy foods that mastication is demanded—the grass-eating (herbivorous) and fruit-eating (frugivorous) animals are deliberate, laborious chewers, while the carnivora may be described as biters and bolters.

HOW THE STOMACH IS OVERLOADED.—Deficient mastication of the soft, pappy, spongy, farinaceous food on which we British are nurtured, enables it to slip down with fatal

facility into the stomach, so that this organ is apt to be overwhelmed with an excess of starch. Further, when starchy food is not adequately masticated, it is not properly mixed with saliva, which contains a ferment capable of converting starch into sugar.¹ Thus a factor favourable to starch digestion does not come into full operation.

A REMEDY FOR INDIGESTION.—The salivary glands collectively weigh nearly as much as the pancreas, and when adequately employed by the thorough mastication of starchy foods they yield an abundance of alkaline saliva. May we not infer from this that the passage of an abundance of such saliva in the stomach is, in some way or other, favourable to the digestion of starchy foods? “Acidity” is one of the commonest forms of indigestion, and alkalis are the most popular remedies for indigestion. Do not these facts suggest that the inadequate functioning of the salivary glands, consequent upon defective mastication, is responsible for much indigestion?

Adequate mastication also favours digestion by comminuting the food and thus increasing the surface exposed to the action of the digestive juices. It also facilitates gastric digestion sympathetically: the events in the mouth make themselves felt in the stomach, which is thus prepared for the reception of food. When called upon to treat a case of indigestion, one of the first things a wise physician does is to examine the patient’s teeth and, if necessary, to urge the necessity of seeking dental aid.

DEFECTIVE MASTICATION AND DISEASE.—Not only does inadequate mastication predispose to the milder forms of indigestion, it is also responsible for such grave gastro-intestinal disorders as appendicitis, ulcer and even cancer.

PREVENTION *versus* CURE.—Just now there is a veritable orgy of abdominal surgery for the purpose of dealing with these

¹ On the modern system the child is made ill by having his stomach deluged with crude starch and it is then sought to mend matters by giving him malt—*i.e.*, maltose—the very substance which he can, and ought, to manufacture within the laboratory of his buccal chamber. It is equally unphysiological to give the normal child any of those numerous proprietary foods containing partially digested starch. The salivary glands should not be cheated of their normal physiological work.—Dr. Harry Campbell, September, 1905.—Ed.

disorders. One would like to see a corresponding interest in their prevention, for they are in large measure preventable by the adoption of rational dietetic methods. It would be difficult to exaggerate the amount of good that could be achieved in this way.

6. SECONDARY LOCAL DISEASE.—Serious local diseases may be set up in the immediate neighbourhood of a diseased tooth. A cyst may form at the root, or an abscess, which may burst in various directions, *e.g.*, externally on the face, leading to an unsightly scar ; or, again, into the large antrum situated within the upper jaw, where it may cause grave trouble.

The irritation of a diseased tooth may set up malignant disease of the jaw, and that of a sharp tooth or ill-fitting plate may give rise to ulceration, or even cancer, of the tongue.

7. BLOOD-POISONING.—Decay of the teeth and inflammation of the tooth sockets (pyorrhœa), implying as they do the generation of septic micro-organisms on an extensive scale, may lead to blood-poisoning. Many constitutional affections probably arise in this way, among which are to be reckoned inflammation of the joints and neuritis. It must be confessed, however, that the presence of pyorrhœa alveolaris is not necessarily incompatible with quite good general health.

8. ECONOMIC LOSS.—Among the evils resulting from diseases of the teeth, the pecuniary loss to the nation must not be forgotten. In so far as dental disease incapacitates a person from work, it causes economic loss. Even the time spent with the dentist has to be taken into account.

AN UNPRODUCTIVE ARMY.—Nor must we leave out of consideration the large army of dentists, dental mechanics and manufacturers of dental appliances, numbering at least a hundred thousand all told—who, were adequate precautions taken to prevent diseases of the teeth, could be largely dispensed with and their services utilised, not for the purpose of repairing preventable damage, but for the actual production of wealth.

CAUSE AND PREVENTION OF DENTAL CARIES.

By J. SIM WALLACE, D.Sc., M.D., L.D.S.

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[Dr. Sim Wallace's many friends and admirers throughout the world will rejoice at the honour recently conferred upon him by the Council of the Royal College of Surgeons in awarding him the "John Tomes" Prize for 1918-1920, "for his work in connection with the prevention of dental caries."—Ed.]

WHAT IS DENTAL CARIES?—To appreciate the cause of dental caries it is necessary to know what it is. This we fortunately know and have known for more than thirty years; indeed, the pathology of the disease is as exactly known as that of any other. There would be little confusion as to the cause of dental caries if all the people who venture to express opinions on the subject knew what caries is. Yet this knowledge may be found in every recognised textbook on dental pathology throughout the world. Dental caries is a disintegration or destruction of the hard part of the tooth, primarily resulting from the action of acid formed external to the tooth. When the enamel has been broken down and dissolved by acid, a relatively easy inroad is made for fresh supplies of acid and micro-organisms, which then are able to eat into the substance of the bone of the tooth and, with further supplies of acid formed from carbohydrate, dissolve the hard part of the tooth.

AN EXPLODED THEORY.—It used to be thought that the acid which destroyed the enamel was diffused throughout the mouth, and that "points of least resistance" in the tooth determined where the carious process would start. Now it is known that teeth decay at definite spots, quite independently of defects in the teeth themselves, and that what determines the site of the primary decalcification is the location of the tiny mass of micro-organisms and the carbohydrates from which they produce the acid. Even imperfections of the calcified teeth do not seem to affect appreciably the rapidity of the destruction, and dentists have long noted that honey-combed or hypoplastic teeth are not more rapidly decayed than are teeth of the most perfect structure.

PREDISPOSING CONDITIONS.—The location of this tiny acid

factory is predisposed to by any, and all, the conditions favouring the lodgement of the easily fermentable carbohydrate food (cooked starch and sugar) upon which the micro-organisms feed.

The food itself may be of an adhesive nature, and may not stimulate the self-cleansing processes, *e.g.*, the salivary secretions, or the motions of mastication and the cleansing actions of the tongue, cheek, and lips. Again, the depth of the crevices in the teeth varies. The greater the depth, the more likely are micro-organisms to lodge with carbohydrates. When great variations are observed marked differences may result. Thus, when the upper lateral incisor is small and the enamel thin, or devoid of ridges, it never decays on the surface flicked by the tongue. If, however, well developed enamel is a pronounced feature and thick ridges are conspicuous on the lingual surface, then a pit or crevice results, and such a tooth is specially liable to become carious. In general the more prominent the development of enamel, the greater the liability to decay. Similarly, irregularities of the teeth may lead to abnormal liability for food to lodge and stimulate the activity of acid forming micro-organisms.

FOOD WHICH CAUSES DECAY.—Although such predisposing causes of the lodgement of carbohydrates exist, teeth decay for one reason and one reason only. Certain kinds of food are liable to lodge for a long time, generally in the crevices of, or between the teeth, and therein to undergo a process of fermentation, giving rise to the destruction of the enamel and later to the softening and disintegration of the deeper parts of the tooth. All carbohydrate foods do not cause decay, even though they may frequently lodge about the teeth. Some ferment far too slowly, *e.g.*, cellulose and, no doubt, uncooked starch. Others may be of a fibrillar or spongy nature, and the acid formed may not be held at, or so near, its point of manufacture as to become sufficiently strong to injure the enamel. Or the saliva may be able to permeate or wash through the lodging food stuff, in such a way as to get rid of the acid, before it is powerful enough to do the slightest harm to the enamel.

THE CHIEF DEFENDERS.—The foods which are most certain

to lodge and ferment and decalcify the enamel are the sugars, when thick, or viscous and cooked starches when of a "short," highly refined nature, as they are liable to form a pasty mass in the crevices of or between the teeth. The acid is then not only quickly formed, but it is retained at or near where it is formed for a long time.

AN ILLUSTRATION.—The nature of the food most liable to cause caries may be seen in an easy way by giving a child with a good set of teeth, say at the age of seven or thirteen, a piece of chocolate. At these ages the hindmost molar may still be free from decay. Half an hour after the child has eaten the chocolate look into the child's mouth and examine the crevices of the hindmost molars. You will probably see in all, or some, a visible amount of chocolate remaining. Note the crevices which retain the chocolate longest and you will find that they are liable to be the starting-point of caries in proportion to their liability to favour the retention of such foods.

THE TEETH.

THE ENAMEL.—It is not necessary to know much about the teeth. It may be noted, however, that they are covered with a sort of cap of enamel. This enamel is practically inorganic and lifeless.¹ Whether it is good, bad, or indifferent, if acid is held in contact with it it is softened and destroyed.

WHERE DECAY STARTS.—Again, teeth vary in form and many

¹ If a sore or ulcer had formed on the cheek, we should have been instantly aware of our danger and have been able to take measures for treatment. We should also know that, in most cases of ulcer or sore, repair will set in and heal the breach. But a hole or ulcer in a tooth will not heal, try how we will; it has no power of repair. The best a dentist can do for us is to clear out the dead tissue, introduce a stopping, and thus avert the disease. The most skilled dentist in the world cannot heal a tooth, cannot make the wall of the cavity produce fresh dentine and new enamel and thus restore the breach; his failure is not his fault, but that of Nature. . . . The chief reason is that the substance of the teeth had to be made so hard and resistant that it was impossible to introduce into the enamel or dentine those soft living units which we speak of as cells. It is in these living cells that the power to heal lies; enamel cannot mend a breach in itself, because it has got no cells; bone can, because everywhere it provides minute but comfortable nests or residences for the numerous living units scattered through its substance.—Professor Arthur Keith, F.R.S., M.D., Incorporated Society of Trained Masseurs, June 29th, 1920.—Ed.

have crevices or pits on the masticatory surface. Moreover, as they are arranged side by side round the mouth, they have, as it were, crevices between them. It is in these crevices, or in crevices formed by the gum and the teeth, that decay almost invariably starts, and unfortunately it is these crevices which the tooth-brush almost invariably does not clean.

THE GLANDS OF ORAL HYGIENE.

Of positive importance in the physiological hygiene of the mouth are the glands of oral hygiene. These are of two kinds, the mucous glands and the salivary glands.

MUCOUS GLANDS.—The mucous glands secrete mucus. This lubricates the mucous membrane and the teeth in such a way as to facilitate the removal of food from the mouth and teeth. Mucus adheres to surfaces, like those of the teeth, and forms a sort of slippery or greasy coating. This, while facilitating the removal of food from the teeth, is itself continually being disintegrated and removed by the bacteria of the mouth, by the friction of foods, and by the fact that when acid foods are eaten it is precipitated, losing its power of adhering to the teeth and thus itself becoming easily removable. Mucus aids the cleansing of the mouth in another way. By nature it is viscid or ropy, so that with each act of swallowing it tends to entrap food particles and, as it were, rope them down the throat.

It used to be taught by physiologists that the function of the mucus was to wrap up the food bolus to facilitate its being swallowed, but it is not the case that a bolus is formed. The food is, or should be, disintegrated by the teeth, and swallowed in a semi-liquid form.

SALIVARY GLANDS.—Like the mucous glands, the salivary glands respond in quality and quantity to the requirements of the food, so that it may be removed from the mouth when it has been properly masticated. Moreover, they provide for the protection of the teeth when food which might otherwise be injurious is taken into the mouth. Thus, in the case of food of an acid nature a large amount of strongly alkaline saliva is poured into the mouth, since otherwise the acid foodstuff might injure the enamel of the teeth.

Again, when sugar or sweets are taken a copious flow of saliva is poured out in order to wash the sugar away, since if sugar remained sticking about the teeth it would lead to their destruction.

NATURE OF THE SALIVA.—The saliva contains ptyelin. Its object is to liquefy starch and so facilitate the removal from the mouth of little masses or particles of starch. Lodged in the crevices of, or between, the teeth, they would give rise to decay, but the ptyelin of the saliva has the power of liquefying a certain amount of this starch, if the particles remain some time after the meal.

A MISCONCEPTION REMOVED.—It is a misfortune that the saliva should have been so long supposed to be essentially one of the digestive juices, since many pernicious ideas and customs have been encouraged by this fallacious doctrine. The discovery of the function of the saliva and salivary mucus, however, will no doubt have a directly corrective effect. When physiologists teach the true function of the saliva and point out how much the appalling state of the teeth of civilised man is due to lack of appreciation of physiological, oral, and dental hygiene, we may confidently predict a phenomenal amelioration of the condition of the teeth.

THE PREVENTION OF DENTAL CARIES.

IMPORTANCE OF EARLY ATTENTION.—That it is better to have decay of the teeth prevented than to have it treated after it has resulted, every one must admit. With young children more especially prevention is most important, as it is difficult, if not impossible, to operate thoroughly upon their teeth. Moreover, such treatment sometimes has the effect of making the child dislike having its teeth attended to. It is thus highly desirable to pay attention to the teeth from the earliest possible age, even when the first baby teeth are just cutting the gums.

WHY MASTICATION IS ESSENTIAL.—At this age the infant instinctively tries to lay hold of objects upon which it can exercise its teeth. This exercise is beneficial, inasmuch as it is the first adaptation necessary for a correct and perfect arrangement of all the teeth. Were it not for this adaptation,

the lower teeth would seldom meet the upper in the best position.

FIRST SOLID FARE.—At this early age, say about the ninth month, an infant may be allowed the gratification of gnawing a crust or a half-slice of toast and butter. As the child grows older, more bread or toast can be allowed at the proper times. Neither should, however, be soaked in milk or other liquid, which would tend to make them easily or quickly swallowed without previous preparation by the infant in its own mouth.

NOSE BLOCKAGE AND MOUTH BREATHING.—Another common condition which leads to bad apposition of the teeth is blockage of the nose and mouth breathing. If the infant cannot comfortably keep its mouth closed the jaws do not grow in that correlated way they should, when both upper and lower jaws are moulded round the tongue, so that colds in the head should be guarded against. The common habit of making the child sleep in a bedroom into which cold and damp air is directly introduced all night, and then bringing it into a warm and possibly germ-laden room by day, should also, as far as possible, be avoided.

HOW TO SECURE HYGIENE OF THE MOUTH.

A CHILD'S DIET.—As teeth are not the only consideration in the diet of the child, the food must be considered also with due regard to the requirements of the body and to economy. This latter consideration compels most people to find the necessary body-building material for young children in cheap foods, such as bread and potatoes. These contain a relative excess of starchy matter, so that sugar should never be added. It is, however, not only physiologically but economically, correct to supplement such foods with butter, margarine, or dripping and food of a more body-building kind, such as fish, meat, cheese, or eggs.

JAM AND MARMALADE.—On the other hand, to add things of a sugary nature such as sweets, jam, marmalade, or honey, is economically and physiologically incorrect, since bread and potatoes already contain in excess that which, from a physiological point of view, may be reckoned as sugar.

Again, from the standpoint of the teeth, sweets, marmalade, jam, or honey must be rigorously excluded from the dietary of young children, except under conditions to be referred to later. Sweets, bread and jam, bread and marmalade, bread and honey, when eaten alone are particularly harmful to the teeth. Not only do they stick about them and become even more acid than originally, but their impermeability prevents both the saliva from protecting and washing the teeth and the deleterious acid formed from becoming diluted or washed away by the saliva. The worst times that a child can take these objectionable foods is between meals and immediately before going to bed.

BISCUITS: A WARNING.—Another common error is the substitution of biscuits for bread. They are three or four times as dear as bread from the point of view of nutrition. They are, further, more objectionable than bread, because they are short and tend to form a pasty mass about the teeth. They are generally sweetened with sugar, and have long been recognised by dentists as conducive to the decay of the teeth. Besides, biscuits are frequently eaten between meals or before going to bed, a practice not only harmful to digestion, but also to be deprecated from the standpoint of dental hygiene.

PATENT FOODS.—Patent and advertised foods are always relatively dear. The lavish amount of money spent on advertising has always to be paid by the consumer, and the grossly misleading statements so often associated with such advertisements are productive of little but harm. As regards patent foods recommended for young children, it may be safely taken for granted that they are injurious to the teeth.

TWO METHODS OF ORAL HYGIENE.—There are practically two methods of securing oral hygiene. The first, the more economical, depends on the restriction or total exclusion of foods and of methods of preparing foods which lead to oral malhygiene, particularly the exclusion of foods with much sugar, and the restriction of the number of meals. This method is uncongenial to some, as indulgence in the sweets of the table must be limited, while economy is irksome to

those who act as though irresponsible to man, child, or State. Economy, to a large extent, involves restriction, and the question is how best to restrict.

The second method, terminating the meal with a cleansing foodstuff, such as uncooked fruit, which will leave the mouth physiologically clean, may be less economical, but permits of all and every kind of food being eaten which the whims or fancies of the individual dictates.

HOW TO END A MEAL.—As many useful and nutritious foods are liable to cause decay of the teeth it is desirable, when circumstances permit, to make it a rule that the meal should terminate with something which will clean the teeth. For this purpose uncooked fruit is most serviceable for children. There is no difficulty in getting them to eat most kinds of fruit, and on account of its crisp, fibrillar, or spongy nature and slight acidity mastication is encouraged, the saliva is thoroughly stimulated, and the mouth and teeth left clean. When fruit or other cleansing food cannot be obtained to terminate a meal, especially the last meal of the day, restrictions with regard more especially to sugary foods must be made.

THREE MEALS A DAY.

HOW MANY MEALS?—From the point of view of *Antar* hygiene, three meals a day are *to be* *desired*. Many children, after the age of two and a half years, are much benefited by the reduction of their meals to three in number. The longer interval between meals, the more perfectly *the* *longer* physiological processes ready to deal satisfactorily with an ordinary meal. If this plan is adopted, it is unnecessary to tempt the palate with wholesome, or probably unwholesome, appetisers. Hunger is the best sauce, and the enjoyment of the meals depends more on this than upon the refinements of the cookery or the flavourings employed. Moreover, every additional meal means so much additional trouble in the way of preparation and washing up. The number of meals is largely a matter of habit, and the little extra meals may be regarded as bad habits.

SOME SIMPLE RULES.—I may put the principles of prevention in the form of simple rules.

1. During the first two and a half years of life all starchy or sugary food, except milk, should be given in a firm or fibrous form, so as to stimulate mastication and insalivation, and thus to promote the healthy growth of the jaws and the regular arrangement of the teeth. *Bread, rusks, or any other farinaceous foods should never be added to or soaked in milk.* Bread with crust (and butter), toasted bread (and butter), should form a considerable part of the solid part of the meals habitually given to children of this age. As the infant passes from the milk diet to the more solid diet, the milk should be more and more diluted with water. During this period also the solid food should be eaten first and the milk and water taken after.

2. After the age of two and a half years, children should always have a considerable amount of the farinaceous food in a form which will stimulate a pleasurable amount of efficient mastication. The albuminous part of their diet should also be presented so as to encourage mastication, *e.g.*, boiled fish, meat, and later, bacon. Milk, or rather milk and water, should only be allowed in small amounts.

3. The meals should be arranged in such a way that if soft starchy or sugary food has been eaten, the mouth and teeth will be cleansed by food of a detergent nature taken immediately after. Thus, when sweets of any kind, *e.g.*, milk puddings, jam rolls, cake, sweet biscuits, bread and marmalade or jam are eaten, fresh fruit should be eaten afterwards.

4. Three meals daily are to be preferred to any greater number, as the longer the interval the more hygienic is the state of the mouth and stomach, and therefore the more perfectly adapted for the reception of a further meal. Sweets, chocolate, or biscuit and milk should never be eaten between meals or before going to bed.

When these rules for the prevention of decay in teeth cannot be observed, some attempt should be made with a small tooth-brush to clean the crevices of and between the teeth after every unhygienic meal, but as this is extremely difficult to do effectually without injuring the teeth or gums, it is advisable to have children, who are brought up in this way, taken regularly to the dentist from the age of three onwards every six months, till the teeth become crowded

and irregular ; thereafter the visits may require at times to be more frequent until all the natural teeth have been replaced by artificial substitutes.

FOODSTUFFS AND DENTAL CARIES.

The following foods are not cleansing, and are liable to induce dental caries :—

Farinaceous and sugary food in general without fibrous element.

Examples : Sweet biscuits and cake, bread and marmalade, bread and jam, new bread without crust, bread soaked in milk, milk puddings, porridge and sugar, preserved fruit, chocolate and sweets of all kinds, honey.

Liquids : Cocoa and chocolate.

These foods should not be eaten, except when followed by foods of the cleansing kind.

The following foods are cleansing and preventive of dental caries :—

Fibrous foods generally.

Examples : Fish, meat, bacon, poultry, fruit, pickles and savouries, uncooked vegetables, lettuce, cress, radish, celery. Cooked vegetables are, as a rule, cleansing, but in a less degree than uncooked vegetables.

Though not fibrous, butter, margarine, dripping, are inimical to dental caries ; so, too, are acid drinks, such as Russian tea, and water when taken after meals.

DENTAL CARIES AND SWEETS.

By JAMES WHEATLEY, M.D.

County Medical Officer and School Medical Officer, Shropshire County Council.

ORIGIN OF PAPER.—Presumably I was asked to read this paper, the title of which was selected for me, because, following on the lines of the teaching of Dr. Sim Wallace, I have for the last twelve years or more taken an active interest in the prevention of dental caries and have made certain investigations with the object of determining the influence of the eating of sweets upon the teeth of school children.

The restrictions and alterations of the food supply during

the war made it possible to compare the teeth of children brought up under very different food conditions. The comparison of the teeth of post-war children with those of pre-war children throughout the country at the age of five years should prove of the utmost value in determining the effect or otherwise of food on the teeth. In the county of Salop we were particularly fortunate in having had a careful survey of the teeth in the pre-war years.

Before dealing with the incidence of dental caries amongst the school children of Shropshire and its bearing upon the causation of caries by the eating of sweets and soft starchy food, I wish to make a few statements so as to concentrate the discussion on essential points.

HOW CARIES BEGINS.—It is generally accepted that the only way in which caries commences is by the solution of the enamel of the teeth by acids formed from carbohydrates in the food. This obviously does not exclude the possibility of powerful predisposing causes which either interfere with the formation of the teeth, or facilitate the action of the acid formed from food.

ITS UNIVERSALITY.—Dental caries is almost universal (in the county of Salop in the years 1911-14 only 4 per cent. of the school children at the ages of five and twelve were free from caries), and has enormously increased during the last two or three generations.

THE PRINCIPAL CAUSE.—Its universal and greatly increased prevalence during the last two generations are most important matters for consideration in our endeavours to determine the principal cause or causes. For example, if the artificial feeding of infants or illnesses in infancy and childhood, such as measles or rickets, or alteration of the secretion of the ductless glands, or the character of our food supply, is suggested as the chief cause, it should be one not only almost universally prevalent, but which has increased enormously during recent years.

This test rules out as principal, but not as contributory, factors all the suggested causes of dental caries, except that of the character of our food and the way it is eaten.

The enormous increase of caries during the last hundred

years has synchronised with a great refinement of our starchy food and a great increase and concentration of our sugary food—I might add with a great increase of sloppy food.

REFINEMENT OF FOOD A DANGER.—Recent investigations show the danger of eliminating substances vital to health in our processes of refinement. Everything points to “whole foods” being satisfactory, and to refined or manufactured ones being deficient in some substances or quality. Thus, until quite recently, margarine was stated to be equal in value to butter because equal energy could be got from it. Now we know that this is quite untrue, although the deficiency may not be so much due to the vegetable seed from which the fat is abstracted as to the method of abstraction. Is it not at least probable that the fibrous constituents of food are also necessary for perfect health? The assumption should be that when a food is refined it probably is not such a complete and satisfactory food as in its natural state, and this assumption should be acted on as far as possible.

SUGAR AND SWEETS.—Sugar is not only a “manufactured” food, it has been subjected to elaborate chemical and mechanical manipulation. It is further a concentrated food and is eaten in the form of “sweets” between meals, when no food should be entering the stomach. It is eaten without the accompaniment of vigorous mastication, which is probably the only true method of keeping the teeth free from acid-forming food deposits. Moreover, except in the form of honey, sugar occurs in Nature only in fruits, sweet grasses, and roots, and consequently, except for refinement, could formerly only be obtained in small quantity and by much exercise of the jaws.

These are the *a priori* grounds for considering that the eating of sweets is responsible for dental caries. The same reasons mostly apply to other concentrated sugary foods and to refined starchy foods.

Inspections of school children in the county of Salop appear to furnish definite proofs.

The figures given are of two kinds:—

I. Those relating to children grouped according to the amount of sweets they were reported to eat.

II. Pre-war figures compared with post-war figures.

TABLE I.
COUNTY OF SALOP ELEMENTARY SCHOOL CHILDREN.

INSPECTIONS BY THE SCHOOL MEDICAL INSPECTORS.

Class 1.—Large quantities of sweets eaten ; almost every day.

Class 2.—Considerable quantities eaten ; several times a week.

Class 3.—Few sweets eaten ; about once a week.

Class 4.—No sweets at all eaten.

		Class 1. Large.	Class 2. Considerable.	Class 3. Few.	Class 4. None.
Number of children examined	..				
	Age 5	643	2,750	4,976	204
	Age 12	462	3,740	7,246	260
Number of carious teeth per child	.. ..			
	Age 5	8.7	7.3	6.3	5.3
	Age 12	5.5	5.1	4.5	4.2
Percentage of children free from caries	..				
	Age 5	2.2	3.0	5.3	11.8
	Age 12	2.8	2.3	3.9	13.5

PRE-WAR AND POST-WAR FIGURES.

TABLE II. (A).—INSPECTION BY MEDICAL INSPECTORS.

		Average number of Decayed Teeth per Child.			Percentage of Children with Teeth free from Decay.		
Year.		Age 5.	Age 8.	Age 12.	Age 5.	Age 8.	Age 12.
1910	.. ..	5.7	—	4.0	—	—	—
1911	.. ..	6.1	—	4.5	7.0	—	4.0
1912	.. ..	6.8	—	5.0	3.0	—	1.5
1913	.. ..	6.6	—	4.6	5.0	(5.0)	3.0
1914	.. ..	6.8	—	4.8	5.0	—	3.0
Average	.. ..	6.4	—	4.6	5.0	—	2.9
1919 (last three months)	.. ..	2.1	3.6	2.1	44.4	12	27.1 ¹
1920 (first three months)	.. ..					

The post-war figures of the medical inspectors are closely confirmed by those of the school dentists, as the following table shows :—

¹ The children at this age period after the war were 13 years of age.

TABLE II. (B).—COMPARISON OF MEDICAL AND DENTAL POST-WAR INSPECTIONS.
Average number of Decayed Teeth per Child.

		Examinations made by :					
		Medical Inspectors.	School Dentists.			Medical Inspectors.	
		Age 5.	Age 6.	Age 7.	Age 8.	Age 8.	Age 13.
1919 (last three months)	..	2.1	2.6	3.2	3.6	3.6	2.1
1920 (first three months)	..	1.9	—	—	—	—	2.1

CONSIDERATION OF TABLES.

TABLE I.—There was an excess of about 60 per cent. of caries at the age of five, and 30 per cent. at the age of twelve amongst Class I (large amount of sweets) over Class 4 (no sweets). There were, roughly, five times as many children free from caries in Class I as in Class 4. Still, the amount of caries in the children said to have no sweets was high. The table is somewhat inconclusive, and points to "sweets" as one only of the causes of caries.

TABLE II. (A AND B).—The figures in these tables are most striking, and if confirmed by further observations throughout the country should prove of the utmost importance in solving the problem of the causation of dental caries. The pre-war figures are based on the examination of 37,527 children and the post-war figures on the examination of 5,910 children by the medical inspectors and 4,683 by the dentists.

Possible fallacies have been sought for, but so far have not been discovered. It is probable that the pre-war inspections were made with somewhat greater care than those since the war, but the post-war figures are confirmed by the inspections made by the school dentists, and these were made with the aid of the probe and mirror.

TABLE II. (B).—AN ASTOUNDING IMPROVEMENT.—The most remarkable improvement was at the age of five, as is shown clearly by the increase of children free from caries from 5 per cent. to 44.4 per cent.

Children, age five in 1920, have been subjected to war conditions during the whole of their lives. So far as children

under five are concerned no greater result could be expected if these conditions had extended over a period of fifty years instead of five years.

A HOPEFUL PROSPECT.—In a paper read before the North-Western Branch of the Society of Medical Officers of Health in 1912, after suggesting that the extreme prevalence of dental caries could not be due to heredity influences, I said: “This is extremely important, because it means that if we can get rid of those harmful habits which are responsible for caries we shall in a single generation be able to get back the teeth to as good a condition as obtained, say, 100 years ago.”

The figures here quoted appear to be a proof of this assertion. What can the apparent decrease be attributed to?

Firstly, to the restriction and modification of food during the war,¹ affecting principally sugar, bread, and milk. Secondly, to the energetic educational campaign carried on in the county of Salop by health visitors, teachers, medical officers and others.

FOOD IN WAR-TIME.—The restrictions and modifications of food were:—

Sugar.—Price rose from 2½d. in July, 1914, on the outbreak of war, to 6d. per lb. Since then it has varied from 7d. to 8d. per lb., and recently 10½d. Manufacturers were cut down to 50 per cent. for confectionery, sweets, and jam. Amount of sugar consumed for all purposes before the

¹ During the war, the pressure of need obliged us fundamentally to alter our system of diet. Sugar was reduced to the minimum; in the form of sweet-meats it disappeared almost entirely. The pulses were extensively used. Of meat there was none, alcohol was cut down, potatoes were eaten plain, in their jackets, and white bread was replaced by war bread, made of coarsely ground flours. These alterations in diet should produce a decline in dental caries. Have they done so? Here in Mannheim we have tried to estimate, in the case of school children, the general effect of war-diet upon the teeth, and particularly upon those teeth most frequently attacked by caries—the sixth-year molars. The investigation most certainly reveals an improvement; and that improvement may be put down to the changed method of living, together with the regular treatment. Treatment, no doubt, has the lion's share, as is recognised by the great interest shown since the war, both on the part of the Government and the community, in the systematic care of the teeth of school children.—Rudolf Frank, condensed from the *Dental Record*, October, 1920, and *Zahnärztliche Rundschau*.—Ed.

war was 98 lb. per head per annum ; through the war the consumption has been halved.

Bread.—Offal was added to the flour. Pre-war extraction of grain, about 68 per cent., rose to 80 per cent. in 1917, and continued at about this figure, or rather less, to present time. Sale of new bread prohibited ; crusts eaten, not thrown away.

Milk.—Rapid rise in price and diminished consumption.

It is difficult or impossible to apportion the effect on the teeth of these various alterations of food, but it seems likely that the wholesale cutting down of sugar and the almost total elimination of “ sweets ” was the most powerful factor.

Probably the alteration in the character of the bread—the addition of offal, its staleness, and its scarcity—had likewise considerable effect.

MODIFICATION OF HABITS.—Before the war it was almost the rule for children to throw away their crusts, or to get rid of them in some other way. I have several times been told on inquiry as to whether children ate their crusts, “ No, their grandfather eats them for them.” During the war it was the rarest thing to see a crust thrown away. Owing to these various changes better habits of mastication were formed, with good results to the teeth.

The diminished consumption of milk may also have been a contributing factor, as there can be little doubt that milk, particularly taken the last thing at night without any food requiring mastication, is one of the most effective means of causing dental caries.

The possibility of the decrease being due partly to our campaign against dental caries must not be lost sight of. This is not the time for detailing the measures taken, but it will suffice to say that they have occupied a prominent place in our child welfare work.

If the figures given really represent the facts, they not only indicate an enormous improvement in the condition of the teeth of the school children of Shropshire, but they show the lines on which a vast reform of the health of the nation can be effected.¹

¹ “ The great improvement as shown by the above figures, has not been altogether borne out by subsequent inspections, and consequently this matter must be considered as *sub-judice*.”—J. W., October, 1920.

The CHAIRMAN : We are behind time, and I suggest that we take the discussion on the three papers at a later stage. (This was approved.)

(See pp. 260-273.)

AFTERNOON SESSION.

THURSDAY, MAY 13th.

A NEW DEPARTURE.—CHAIRMAN, R. B. WILD, M.D., F.R.C.P., Dean, Faculty of Medicine, Manchester University : This Conference, which is the first public Conference of its kind in this country, marks an epoch in the development of this branch of public health. It is an attempt to bring before the general public the enormous importance of healthy dentition and a healthy condition of the mouth.

WHAT THE WAR REVEALED.—The dentition of this country is certainly worse than that of many others. Opinions, however, are by no means agreed as to the causes. We are to listen to papers by two distinguished people who, perhaps, have done more to investigate and elucidate these conditions than anyone else, and we can but hope that a Conference such as this may eventuate in a considerable improvement. During the war, when examining the recruits one could not but notice the deplorable state of their teeth. They were otherwise, perhaps, suitable and healthy men, but were rejected simply for dental defects, and a considerable percentage was unfit to serve.

AN OBJECT LESSON.—More than twenty years ago my attention was specially called to the matter by a paper from France, which associated a certain form of disease of the skin with diseased teeth. On examining patients at the hospital, one after another, I was much struck by the correspondence between this disease and the bad condition of the teeth. It was agreed, therefore, to adopt a certain amount of control, with the result that equally bad teeth were found in those patients who did not suffer from that disease of the skin. That was an object-lesson as to the generally deplorable state of the teeth, at any rate in Manchester and the immediate neighbourhood.

WHAT DENTISTS DID FOR OUR SOLDIERS.—There is no doubt that during the war an enormous amount of work was done, at great cost of time and labour, by dentists all over the country in improving the condition of the male population. So far as its dental condition is concerned, it should be in a better state than it has been for many years. We want the women and children¹ to have similar treatment, and hence I advocate the establishment of school dental clinics wherever they are needed. They have a great future before them.

THE PROFESSION AND THE PUBLIC HEALTH.—The interest taken in this Conference by our dental colleagues at the University is a valuable sign. The work that the dentists do in maintaining the public health is much under-estimated. The prevention of disease is even more important than its cure, and if the Conference should result in clearing the air as to the causes of dental trouble we shall have one solution of the difficulty which has been prominently brought before the public, viz., the shortage of dentists. A better way of dealing with the situation than by registering unqualified men would be to reduce the claims upon the dentist by preventing diseases of the teeth. There is considerable danger to the health of the country in allowing a large number of men who have not been trained in physiology, anatomy, or in any other subjects, to practise upon the public without restraint. The proper way to go to work is on the lines of this congress—the prevention of diseases of the teeth, especially caries.

EFFECT OF CERTAIN DIETETIC FACTORS ON THE DEVELOPMENT OF TEETH AND JAWS

By MAY MELLANBY.

REASONS FOR LACK OF KNOWLEDGE.—It must be admitted that in spite of the great strides made by the dental profession during the last fifty years and of the knowledge gained through the valuable researches of Miller, Pickerill, Black, and others, we have not yet fathomed the main

¹ A valuable report on the effects of dental treatment of children and adults upon national health and physique, was presented by Messrs. Denison Pedley, F.R.C.S., L.D.S., President, and William Fisk, L.D.S., Hon. Secretary and now President, School Dentist Society, at the Sixth International Dental Congress, 1914. See pp. 579-590.—Ed.

cause of the appalling state of the teeth of civilised man of to-day.

In my opinion there are two chief reasons for this lack of knowledge: (1) Investigators have not, as a rule, gone far enough back into the period of individual development; and (2) there has been insufficient co-operation amongst dentists, doctors, and experimental physiologists and biochemists.

POSSIBLE SOLUTION.—The problem can be most readily solved by the animal experimental method, undertaken by the physiologist in conjunction with the dentist and the medical man. For, by this method alone, can each point be tested in turn, all other conditions remaining constant. The human being, however, must be the final test animal.

AN UNANSWERED QUESTION.—Few will deny that much dental trouble is caused by the changed diet of man as the result of civilisation, but the question that still remains to a great extent unanswered is: "What are the dietetic factors, the presence or absence of which are responsible for the poor structure and the liability to decay of the teeth of civilised man and of many animals in captivity?"

Diet in respect of the teeth must be considered from two points of view:—

1. The part played by foodstuffs while still in the mouth.
2. The part played by these substances after absorption from the alimentary canal into the blood.

A FUNDAMENTAL PROBLEM.—The first of these problems is no doubt of importance, but I question whether it is of such consequence as some authorities think; the second, on the other hand, seems to me fundamental. We know that some of the absorbed food materials act as a source of energy, whereas others have special functions to perform in supplying the endocrine and other organs with essential chemical groupings; others, again, may raise the immunity of certain cells against noxious agents. In the case of the teeth I shall demonstrate the necessity of a certain dietetic factor, which, either directly or indirectly, assists the ameloblasts and odontoblasts to make full use of the calcium and other substances in the blood in the formation of normal enamel

and dentine. This factor is also necessary in the diet of the young, if the jaws are to be well developed and so allow the proper spacing of the teeth. It seems reasonable to believe, as stated by some authorities, although denied by others, that well formed and regularly spaced teeth are less liable to caries. Moreover, it is possible that the substance above referred to indirectly helps the resistance to caries in later life by stimulating the production of a type of saliva which either resists the growth of some toxic bacteria, or acts on the teeth themselves and so increases their immunity.

NATURE OF INQUIRY.—The research I am about to describe started as an offshoot of my husband's investigations on experimental rickets, and was undertaken for the Medical Research Council. Puppies were chiefly used because the diet and general metabolism of the domestic dog are in many respects similar to those of man, the main difference being that all the organs in the dog both develop and degenerate more rapidly than in man.

CONCLUSION.—I have been led to the conclusion that some substance belonging to that group of foodstuffs known as vitamines, or accessory food factors, is of fundamental importance in the development of healthy teeth and jaws. In this paper the substance will be alluded to as vitamine or factor X.

THE THREE VITAMINES.—Before describing my experimental methods and results, may I say a few words about the three generally recognised vitamines, the antiscorbutic, water-soluble B, and fat-soluble A. The failure, until about 1912, to realise the importance of their presence in the diet is largely due to the comparatively small quantities necessary. For this reason also they have not yet been isolated and hence their chemical nature is unknown. The only means we have of testing whether they are present or absent in a food is by giving the substance to certain animals and noting the result.

Different species vary as regards the relative importance of vitamines. Thus, scurvy results when the antiscorbutic factor is omitted from the diet of a man and some experimental animals, including the guinea pig, but this is not the

case with rats. This vitamine is present in most fresh foods, especially in vegetables and fruits. It is fairly readily destroyed by heat, the length of exposure being as important as temperature.

Water-soluble B is probably identical with the antineuritic factor. Its absence gives rise in man, birds, and some other animals to certain nervous symptoms, whereas in young rats growth is arrested. It is present in the majority of natural foods so far examined, and is very resistant to heat.

Fat-soluble A, in addition to water-soluble B, is necessary for growth in rats; there is, however, experimental evidence that puppies¹ and children² put on weight without it, or when it is present only in traces. This vitamine is found in the yolk of eggs, whole milk, butter, most animal and fish fats, except possibly lard, and also in some green vegetables. It is fairly resistant to heat.

HOW VITAMINES MAY BE LOST.—Vitamines present in natural foods may be lost by artificial treatment. For instance, in the process of polishing rice and in the preparation of white flour, the antineuritic substance is removed. There is, nevertheless, no danger of a deficiency of the antineuritic factor on a mixed diet, and not much real danger of a deficiency of the antiscorbutic factor. It is, however, much more common to find a diet poor in those substances with which fat-soluble A is associated, for, on the whole, these are the more expensive articles of diet.

Vitamine X and fat-soluble A are possibly identical. The properties and distribution of fat-soluble A have been worked out chiefly on rats, and hence the apparent differences in these two factors may be due simply to those in the metabolism of young rats and of puppies and babies.

EXPERIMENTAL METHODS.

Litters of puppies of from five to nine weeks old were given a basal diet (diet A) consisting in general of:—

Separated milk (175–250 c.c. p.d.).

White bread (generally *ad lib.*).

¹ Edward Mellanby, *Lancet*, April 16th, 1920.

² Hess and Unger, *Journal American Medical Association*, January, 1920.

Yeast (about 5 gr. p.d. to supply abundant anti-neuritic vitamine).

Orange juice (about 5 c.c. p.d. to supply abundant antiscorbutic vitamine).

Sodium chloride (1 gr. p.d.).

In many cases *lean* meat (5 to 50 gr. p.d.).

Water (*ad lib.*).

To this basal diet were added the various substances to be tested. In comparable experiments all other factors were kept constant ; the hygienic conditions, such as housing, air, and exercise, were the same, and puppies of one family were used. The experiments were all started and stopped at the same time, and as a rule lasted from three to six months.

NATURE OF DIETS.—The diets were, with few exceptions, pappy, and therefore required little mastication. That they contained sufficient calcium for the requirements of the puppies was shown by the experimental results.

Records were kept during life of

1. The general state of health.
2. The rate of growth.
3. The rate of calcification of the teeth (radiographs).
4. The dates of eruption of the teeth.
5. The position of the erupting teeth in the jaws.
6. The condition of the enamel.

At the end of the experiment the jaws were, as a rule, treated with 10 per cent. formalin and, after washing, preserved either in the dry state or in 75 per cent. alcohol. For histological purposes the central part of one lower carnassial (MI)¹ was specially fixed, and ground sections were, when possible, made by Weil's method, otherwise sections were cut in gum after decalcification. In many

¹ The carnassial was chosen because calcification begins just before birth (*cf.*, six-year old molar) ; it is a large tooth and develops quickly, especially in relation to its size.

cases a fresh upper carnassial (PM⁴) was measured, weighed, ashed, and its total calcium content estimated.

The diets were usually such that the animals were healthy, in so far as growth and general good spirits were concerned, in spite of the fact that rickets developed in those fed on a diet deficient in factor X. Such puppies were also very susceptible to infection.

The pathological condition of the teeth was often much worse than is met with in man, because the deficiency of factor X was greater than is likely to occur in the diet of children.

EXPERIMENTAL RESULTS.

(SEE TABLES I AND II.)

Puppies fed on diet A, to which any one of the following substances had been added, generally developed beautiful teeth and normal jaws: Cod liver oil, whole milk, butter, animal fats (except lard), some vegetable oils,¹ and egg yolk. Whereas those fed on the basal diet, together with linseed oil, babassu oil, some other vegetable oils, extra separated milk, lard, sugar, rice, oatmeal, or egg white, showed, according to the size and rate of growth, some or all of the following defects:—

1. Comparatively soft and poorly developed jaws and alveolar processes, in which osteoid tissue often took the place of bone.
2. Teeth, chiefly the lower incisors, crowded together.
3. A delay in the eruption and a slowing of the eruption of the teeth.
4. A delay in the rate of calcification of the enamel, which, when formed, was to a greater or less extent defective.
5. Deficient dentine, containing numerous interglobular spaces.
6. Light teeth compared to their size with low calcium content.

¹ Experiments indicate that no Fat-soluble A is in vegetable oils. Further experiments are necessary on this point.

7. The greater the rate of growth the greater were the defects when factor X was deficient, *i.e.*, the effects produced were specific and not comparable to those of acute illness.

8. Diminished power of resistance to diseases such as distemper.

CONNECTION BETWEEN RICKETS AND CARIES.—This research, taken in conjunction with that of Edward Mellanby, puts upon an experimental basis the close relationship between the ætiology of rickets and poorly developed teeth and jaws.

Jaws, lantern slides, radiographs, and histological sections were shown to demonstrate these points.

The above described facts suggest that a vitamine, either identical with fat-soluble A, or having a somewhat similar distribution, normally controls the calcification processes in the teeth and jaws, the results of its absence being defective calcification.

INFLUENCE OF THE MOTHER'S DIET ON HER CHILD.—It is undeniable that the mother's diet during pregnancy and lactation influences the development of the offspring. It is also certain that the mother, unless supplied with all the necessary substances, sacrifices up to a certain limit her own tissues. For instance, she may supply deficient amino-acids in this way and possibly also vitamines. This may be one reason why a pregnant woman is often more liable to caries, for her body may be furnishing to the embryo substances (possibly vitamine X) which are necessary to assist the resistance of her own teeth to decay.

In the case of vitamines, however, mobilisation and transmission to the offspring may not be as easy as in other cases. In the ante-natal period the vitamines must pass through the placenta, and post-natally through the mammary glands. Thus the nourishment supplied to the offspring tends to contain all the necessary factors in the correct proportions, especially in the adequately fed mother. The importance of a properly balanced diet is becoming more and more recognised, but we do not know enough about the constituents of such a diet, which must, of course, vary at different periods

of life and also for different species. Hence the necessity of breast feeding when possible is obvious.

ANIMALS AND VITAMINES.—It must not be forgotten that, so far as we know, animals have not the power of synthesising vitamins. They must, therefore, depend on vegetables for their supply. The vitamins present in cow's milk come from the grass and other foods eaten by the animal; hence the importance of the suitable feeding of cows during the winter months.

BEARING OF DIET ON THE TEETH.—The few experiments I have performed on pregnant and nursing bitches indicate the importance of the mother's diet when considering the development of the deciduous teeth of the offspring. When the bitches were fed on a diet in which vitamine X was deficient, the dentine of the deciduous teeth contained small interglobular spaces, suggesting that the bitches had been unable to supply sufficient factor X. In the case of two puppies, fed by hand from birth on skimmed milk and a small quantity of linseed oil, the dentine of the deciduous teeth was also slightly defective.

HUMAN EXPERIENCE CONTRASTED.—Are these experimental results in keeping with human experience? There is certainly much evidence in favour of this. We know that the Esquimaux, with their flesh and blubber diet, have perfect teeth, regularly arranged in the jaw. The people of the island of Lewis in the Hebrides, where the normal diet consists of fish, eggs, and oatmeal, and the children are breast fed, have also excellent teeth, in spite of the dreadful unhygienic condition of the houses. On the other hand, the urban artisans of industrial districts, who are dependent more and more on a diet rich in carbohydrates and poor in milk, eggs, and animal fats, have usually bad teeth.

AN EARLY INQUIRY.—As the result of an investigation made in 1902 by Dr. Hall, of Leeds, he stated that he considered the better teeth of the Jewish, as compared with those of Gentile children could be ascribed to their diet being richer in milk, eggs, and fat fish, all of which substances contain vitamine X. The above statement was, of course, made by Dr. Hall long before vitamins were heard of. If this hypothesis is correct

we should expect the teeth of the children of Central Europe to be very bad in view of the recent lack of so many of the substances with which vitamine X is associated.

The younger the animal, the more vitamine X does it require to keep things normal. This may be related to the comparatively rapid growth which takes place before birth and for the first two years of post-natal life. The rate of growth of a baby is clearly seen in Dr. Truby King's diagram.

The amount of vitamine X necessary to keep the teeth development normal appears also to be related to the energy-bearing constituents of the diet and to the amount of exercise taken by the animal.

May I conclude by asking you to pay special attention to the *facts* put before you? My deductions may be erroneous and may have to be changed as new truths come to light, but the facts described cannot alter.¹

TABLE I.

EFFECT OF FAT-SOLUBLE A ON THE TEETH AND JAW FORMATION OF THREE PUPPIES OF THE SAME FAMILY.

No.	Age. Weeks.	Diet.	Jaws.	Arrange- ment.	Enamel.	Dentine.
15	27	A • 10 c.c. linseed oil and extra sep. milk	Spongy (osteoid tissue)	Irregular	Poor	Poor inter- globular spaces
16	27	A • 10 c.c. linseed oil	Ditto	Ditto	Ditto	Ditto
17	28	A • 5 to 7.5 c.c. cod liver oil	Hard compact	Regular	Good	Good

Hygienic conditions the same in each case.

¹ For additional details see paper on "Experimental Evidence Demonstrating the Influence of a Special Dietetic Factor on the Development of the Teeth and Jaws," read to the British Society for the Study of Orthodontics, *Dental Record*, February 1920.—Ed.

TABLE II.

No.	Diet.	Weight of Dry Carnassial.	CaO in Carnassial.	
16	A • 100 c.c. linseed oil	Grams. 0.472	Grams. 0.154	} Same family and same age at death
17	A • 5 to 7.5 c.c. cod liver oil	1.129	0.395	
20	A • 10 grams lard per diem	0.779	0.261	} Same family and same age at death
21	A • 10 grams butter	1.084	0.381	
22	A • 10 grams babassu oil	0.751	0.265	

TABLE A.

SOME EXAMPLES OF THE DISTRIBUTION OF THE ANTISCORBUTIC VITAMINE.

<i>Present.</i>	<i>Absent.</i>
Orange juice	Wheat
Lemon	Maize
Swede	Rice
Germinated pulses	Dried peas
Tomatoes	Dried lentils
Cabbage	Tinned meats
Beans (fresh)	Yeast
Etc.	Meat extract, etc.

TABLE B.

SOME EXAMPLES OF THE DISTRIBUTION OF WATER-SOLUBLE B
(ANTINEURITIC VITAMINE).

<i>Present.</i>	<i>Absent.</i>
Wheat germ and pericarp.	Endosperm of grains
Maize Rice	Butter
Eggs (dried and fresh)	Cream
Peas (dried and germinated)	Cod liver oil
Lentils (dried and germinated)	White flour
Nuts Liver	Polished rice
Sweetbreads Etc.	Etc.

TABLE C.

SOME EXAMPLES OF THE DISTRIBUTION OF THE FAT-SOLUBLE A FACTOR
(RAT-FEEDING EXPERIMENTS).

<i>Present.</i>	<i>Deficient or Absent.</i>
Cod liver and	Lard
Fish oils	Vegetable oils
Butter	Hardened fats
Animal fats (except lard)	Margarines (vegetable fats)
Milk	Skim milk
Eggs	White flour
Cheese (whole milk)	Cornflour
Cabbage	Tea
Lettuce	Sugar
Spinach	

The CHAIRMAN: We have all listened with the greatest interest to Mrs. Mellanby's able account of her valuable investigations and experimental results. Before inviting discussion, I will ask Mr. Badcock to give us his paper.

DIETETIC AND OTHER CAUSES OF IRREGULARITIES OF THE TEETH.

By J. H. BADCOCK, L.D.S., M.R.C.S., L.R.C.P.

Past President of the British Society for the Study of Orthodontics, and formerly Dental Surgeon to Guy's Hospital and Lecturer on Operative Dentistry.

STORY OF THE TEETH.—Before we can understand what makes teeth irregular we must know what makes them regular, what forces come into play to make them take their right places. Let us see how it happens. In a child of normal growth, at about two years of age, the milk teeth, twenty in number, are all in place. About a year later the front teeth begin to move apart and by the sixth year they should be widely spaced, owing to the growth of the jaw for the purpose of accommodating the much larger second teeth.

About this time the "six-year-old" molar teeth appear, the largest and most important teeth in the whole arch, the lower first. They displace nothing, but come up behind the last milk teeth. On each side the opposing tooth soon follows. They grow towards one another, guided by the milk teeth in front, the tongue inside, and the cheek outside

(there is no room to go backwards) until their cusps touch and, sliding one upon the other, lock both teeth in correct occlusion.

Now the child has nearly doubled its masticatory efficiency and can afford to lose its first pair of incisors. The new ones come up side by side and the pair are guided into place by the adjoining milk teeth and the tongue and the lips. Then follow in order the lateral incisors, the first premolars, second premolars, and, replacing the last of the temporary teeth, the canines, in time to be useful for fighting purposes. Each tooth is guided into position by the one in front and one behind, and by the tongue and cheek on either side, until it interlocks with its antagonist.

By about eleven years of age—the date is rather variable—all the milk teeth have given place to their permanent successors. A year later the second, or “twelve-year-old” molars, come up behind and touching the “six-year-old” molars; and between the ages of sixteen and twenty the full set of thirty-two teeth is completed by the cutting of the third molars, or “wisdom teeth,” at the end of the row, behind and touching the second molars.

CHIEF TEMPORARY TOOTH.—The most important of all the temporary teeth in their work as guides is the last milk molar. If this tooth be partially or wholly destroyed by decay, or if it be extracted before its time, or if, by reason of the loss of a tooth in front of it, it has moved forward from its place, the incoming six-year-old molar will move forward, it will fail to interlock properly with its opponent, and will occupy the space reserved for the second premolar, so that when this comes it will either be forced out of line, or will cause crowding of all the teeth in front of it. Moreover, the twelve-year-old molar will follow up the six-year-old, and the wisdom tooth in turn will follow it, all the molars in this way coming to occupy positions more forward than natural. So the premature loss of this one milk tooth may throw out the whole of the permanent set. Here we get a fertile source of irregularity, viz., premature loss of milk teeth, allowing other teeth to fall into the places which should be reserved for their successors. The cause of such loss is generally caries. Of the

dietetic errors which help its production you have heard already.

Just as an incoming tooth is easily guided into its right position by gentle forces, so it is as easily deflected. A milk tooth, which has not fallen out when it should do so, or even a small piece of one loosely attached, may cause serious irregularity of its permanent successor.

Milk teeth, which have decayed and become "dead," are not absorbed, as they are when healthy, and may remain for years in the way of their successors unless removed. Even healthy teeth, whose roots have been absorbed, often remain sticking to the gum longer than they should, a state of things that is much encouraged by the use of soft food.

THUMB-SUCKING.—Thumb, or finger, or "comforter" sucking will cause the upper front teeth to protrude, and the lower front teeth to be pressed back. When a "comforter" is the cause no permanent harm is done, as the habit is given up before the child is old enough for it to have any effect on the second set, but thumb or finger sucking is often practised much longer, sometimes into adult life. This habit is frequently associated with the fumbling of something hairy or woolly with the other hand, and often may be easily cured by the removal of such object.

LACK OF GROWTH OF JAWS.—Besides these accidental factors of irregularity, as they may be termed, there is another, far more important and far-reaching in its results, viz., lack of growth of the jaws themselves, so that they are not large enough to contain the proper number of teeth in even line. The causes are still obscure. We know that certain of the ductless glands, the thyroid and the pituitary, exercise a mysterious influence on growth, *e.g.*, in cretinism, and acromegaly, and it would appear that the upper and lower jaws are controlled by different growth centres; but such conditions hardly come within the scope of the present paper.

SOFT FOOD AND THE TONGUE.—More important causes, from the practical standpoint, are those depending on function and nutrition. Sim Wallace holds, and his theory is generally accepted, that the main cause is underdevelopment of the tongue, due to the use of soft food. He says, "the tongue does not attain, as a rule, at the present day to its normal

size on account of its functional activity falling far short of the normal. The food of the present day is riddled of its coarse and fibrous material, the amount of mastication to which it is subjected is relatively little, and the amount of use to which the tongue is put during the process is much less than when foods were subjected to the relatively great amount of mastication required before the advent of civilisation."

We have already seen how large a part is played by the tongue acting against the lips and cheeks, the tongue pushing outwards and the cheeks inwards, in guiding the incoming teeth into approximately correct line until they come into contact with the cusps of their antagonists, which, by interlocking with their own, complete and perfect this apposition.

The tongue and cheek are muscular structures, and muscle grows by use and shrinks by disuse. It is therefore reasonable to suppose that if the food be soft, the tongue will fail to attain to its normal size and strength and the cheeks will be flabbier than normal, so that the action and reaction between them will be feeble and insufficient to attain its proper effect.

BREAST FEEDING : AN INCIDENTAL ADVANTAGE.—If the child be bottle-fed trouble may begin earlier. A child suckling at its mother's breast takes into its mouth, not only the nipple, which is comparatively large and firm, but some of the breast too. This it vigorously kneads between jaws and tongue. The artificial rubber teat is smaller and softer, only a little suction is required to withdraw the milk, and practically no kneading, so that the tongue gets less work and, as the child gets a smaller mouthful, there is less pressure on the jaws too, and both tongue and jaws lose a natural stimulus to growth. While this is doubtless true one must not lose sight of the fact that the great majority of bottle-fed babies develop regular arches of milk teeth and that irregularity of this set is comparatively rare. It is to lack of growth after the second year, *i.e.*, when the child should have taken to diet requiring full mastication, that most of the crowded mouths are due.

EFFECT OF MOUTH BREATHING ON THE JAWS.—In mouth breathers we often find crowded, unexpanded upper arches

with normal lower arches. This may be explained by the fact that, when the mouth is open, the lower jaw alone gets the pressure of the tongue, while the upper jaw largely escapes its influence, whereas when the mouth is shut it is practically filled by the tongue, which then presses equally on both jaws.

TEXTURE OF FOOD AND DENTAL GROWTH.—"Function," says N. G. Bennett, "is the best stimulus to growth, whether by reflex stimulation of the trophic nerves or by increasing vascularity, or both, and there can be no doubt that insufficient mastication is responsible for much imperfect development of the jaws. . . ." When the child is wrongly fed on soft foods and the teeth are not used with sufficient force, or for long enough periods, there must be not only diminished stimulus to growth but feeble muscular development and lessened blood supply."

L. W. Baker made experiments on young rabbits by grinding down the teeth on one side, and found as a result marked differences in the development of the bones of the skull between the two sides.

Sir W. Arbuthnot Lane and W. I. Roe have recorded cases where, owing to ankylosis of the temporo-maxillary joint in early life and the consequent loss of function of the mandible, its growth was profoundly affected.

"ACCESSORY FOOD FACTORS," OR "VITAMINES."—The quality of the food is also of importance. We used to be taught that protein, fats, carbohydrates, salts and water, in due proportion, were all the ingredients needed in a dietary, but now, as you have just heard from Mrs. May Mellanby, we know that there are other substances called "accessory food factors," or "vitamines," existing in minute quantities, but all-important to life and health. At present three only are known: "antiscorbutic," "antineuritic," and "fat soluble A," but there are probably many more.

Absence of the antiscorbutic factor from the diet gives rise to scurvy and, as has been recently shown, to defective changes in the teeth of guinea pigs. It is found in the largest quantities in fresh vegetables and fruits, oranges and lemons being particularly rich in it.

The antineuritic factor, or "water soluble B," is found

in the germ and pericarp of wheat, maize, and rice (the parts that are rejected in making flour white and in polishing rice). It has a wide distribution in Nature, and is present in the majority of natural foods. It has a great resistance to heat.

"Fat soluble A" is present in most animal fats (cod liver oil is particularly rich in it) but absent from most vegetable fats. It is present in green vegetables.

MRS. MELLANBY'S EXPERIMENTS.—Mrs. Mellanby has described to you how she has carried out a long series of experiments on puppies fed on a diet from which "fat soluble A" was absent.

(After summarising her conclusions, the paper proceeded.)

It does not follow that what is true for dogs must necessarily be true for man, but dogs and men thrive on much the same diet, and there is, at any rate, a probability that they would react in a similar manner.

It was because Eijkmann in 1897 noticed that his pigeons were suffering from the same symptoms of polyneuritis as the patients in his prison that he was able to trace the cause of beri-beri to the use of polished rice, *i.e.*, rice from which the cortex and germ had been removed, thereby depriving it of the antineuritic factor, and Mrs. Mellanby's experiments on dogs undoubtedly warrant us in attaching importance to the presence of "fat soluble A" in the food, especially of growing children.

SUMMARY.—In this brief paper on a large subject, I have lightly touched upon the ways in which irregularity of the teeth may be caused. It may be thus summarised:—

Irregularities of the teeth are due to :

1. Accidental causes, *e.g.*, premature loss of the milk teeth, undue retention of the milk teeth, and habits such as thumb-sucking.

2. Deficient growth of the jaws.

Some of the causes of deficient growth, *e.g.*, the impaired influence of the ductless glands presiding over growth, remain obscure; but there is no doubt that in the prevention of the accidental causes and in providing the stimulation necessary to normal development of the jaws and regular alignment of the teeth, the texture and the quality of the food are both of the utmost importance; the texture,

because hard food and hard food only, develops function to the utmost, the quality, because it has been conclusively shown that, in the absence of certain components, healthy growth does not occur.

Translated into practice this means that :—

1. The “vitamines” necessary to the growth of the child must find place in the food of the mother during pregnancy and lactation.

2. The infant should be breast-fed. Thereby it secures not only the kind of food which, of all others, best suits its needs, but it benefits by the stimulating effect which natural suckling has on the growth of the jaws and tongue.

3. As soon as it has teeth it should have some hard food, and as soon as it has all its teeth the harder the food the better. Nature knows no milk puddings, no stage intermediate between the mother’s milk and the food the mother eats herself.

(It is an interesting fact that the surface area of the first set of teeth bears a larger proportion to the body weight of the child than does that of the second set to the body weight of the adult, so that “milk teeth” is a misnomer; they are evidently meant for much harder use.)

Hard chewing tends to develop the jaws and tongue, to keep the teeth clean and so to prevent caries, and it favours the loss of the milk teeth at their proper time.

A diet that makes for caries makes for irregularities.

Brown or stone-milled bread (plain, toasted, or baked), uncooked fruit, salads, vegetables, nuts, eggs, cheese, butter or other animal fat, fish, meat, and milk afford a choice of food calculated, by its consistence and its quality, to satisfy all the demands of healthy growth and appetite.

So nurtured, our children may hope to rival at least one of the charms of the beautiful Shulammit, of whom Solomon sang in passionate admiration :—

“Thy teeth are like a flock that are newly shorn
Which are come up from the washing,
Whereof every one hath a twin,
And none is bereaved among them.”

The CHAIRMAN : We have had two excellent papers, one from the experimental side and the other from the clinical

side. The subject is now open for discussion. Questions, of course, may be asked, and I am sure that the readers of the papers will do their best to answer them.

WHITE BREAD AND THE TEETH.—Miss MAY YATES, Hon. Secretary, Bread and Food Reform League: We must all have listened with the greatest interest to Mrs. Mellanby. I suggest that white bread¹ has a specially bad influence upon the teeth. People who are fed almost entirely on meat like the Eskimos, the Gauchos of Argentina, and the ancient Maoris of New Zealand, have remarkably good teeth, but when you take those who use large quantities of meat and white bread, like the Australians, you get exceedingly bad teeth—from 90 to 95 per cent. suffer from dental caries. There is good reason for believing that white flour, which has been deprived of the phosphates of lime, has a serious effect on the teeth. It is stated that the ancient Maoris had splendid teeth, but some of you may be, like me, abstainers from flesh food, and may prefer dental caries to cannibalism. Good teeth can, however, be found without cannibalism, and even without cod liver oil, because the essential fat soluble A can be had in a pleasanter form in milk, butter, bananas, the green leaves of vegetables, and the germ of whole wheat. In the northern provinces of India, Dr. Harry Campbell's idea is realised, and dentists are unknown and unrequired. White flour is there, however, conspicuous by its absence. The use of wholemeal bread will be of the greatest advantage in the struggle against this terrible disease of dental caries, because it will provide not only the lime, but more fat soluble A, and will promote mastication. I hope that members of this congress will do all they can to bring whole meal into general use.

RICKETS AND DENTAL CARIES.—Dr. JAMES WHEATLEY, County and School Medical Officer, Shropshire County Council: We are much indebted to Miss Yates and particularly to Mrs. Mellanby for the most interesting statement as to the results, so far, of her experiments. I do hope, however, that we shall not relax our efforts because there may be some

¹ For information on the nutritive value of flour and bread, best ways of using, etc., see *Facts for Patriots*, 2nd and 4th series, 4d. each; and *Eat Victory Bread*, 1d.—Ed.

hitherto unknown or partially proved factors in the production of dental caries. The experiments hold out some prospect that defective jaws and teeth may be due, to some extent, to a deficiency of vitamins. I trust it may be so, as I look upon rickets as one of the most preventable of all diseases, and if we can prevent dental caries by the prevention of rickets it will be the easiest way of doing so. The distribution, however, of rickets does not correspond at all with that of dental caries. The county of Shropshire, for instance, has, compared with large industrial towns of the Midlands and the North, a small amount of severe rickets, Yet dental caries is extremely prevalent. For this reason, amongst others, I am of opinion that rickets is not one of the principal factors in the causation of dental caries.

A CONSTITUTIONAL DEFECT ?—Moreover, if dental caries were due to some constitutional disease, of which it was one symptom only, what an awful state of things this would imply, as almost everyone suffers from caries. Whatever views we may hold with regard to the position of rickets as a predisposing cause of caries, it is simply a predisposing cause and takes no part in the actual decay. I am sorry to hear it suggested that dental caries is in any way comparable to ordinary diseases of the body, in which the diseased part is freely supplied with blood and lymph. Such a suggestion obscures the real problem.

CHEMICAL ACTION THE KEY.—It is proved beyond doubt that the first and really important stage of dental caries is purely a chemical solution of enamel by acid formed from food. If the enamel is practically a dead substance, incapable of repair and without blood or lymph supply, there can be no question of action and reaction, or of the production of immunity.

NO CASE FOR A "WAIT AND SEE" POLICY.—No one can welcome more than I do the most important investigations now going on with regard to food deficiencies, or be more eager to utilise the knowledge thus gained. There is, however, nothing, I submit, so far that should make us pause in our campaign for the prevention of dental caries on the lines laid down by Dr. Sim Wallace. We should rather redouble our efforts.

RICKETS AND HOUSING.—Mr. T. C. HORSFALL, Manchester : Might I say a word with regard to the possible connection between dental caries and rickets ?¹ If the two diseases have the same causes, great light ought to be thrown upon the question by investigation. I believe that the chief factor in producing rickets is the horrible nature of the dwellings of the people.

HIGHLANDERS AND PORRIDGE.—We were led to believe that Highlanders lived upon oatmeal, in the form of oatcake and oatmeal porridge, and had splendid teeth. As a result of further examination, it is stated that some Highlanders, at any rate, who eat oatmeal porridge have abnormally bad teeth. What is the truth ?

A DOUBTING THOMAS.—Dr. SIM WALLACE : Like all the other members of the Conference I feel that we are greatly indebted to Mrs. Mellanby and Mr. Badcock for their excellent papers, which have been models of lucidity. In the case of Mrs. Mellanby's paper the lucidity will perhaps carry some rather further than I am inclined to be carried. I would like, first of all, to ask if the apparent hypoplasia² of the enamel took place at the time of its formation and in strict relation to the time of special feeding, *i.e.*, long before the eruption of the teeth. We know that in rickets the teeth erupt late, and it is quite possible that in a similar disease they might calcify slowly.

CHILDREN'S TEETH—A REMARKABLE FACT.—There is a great difference apparently between what we find in children and in puppies kept in a cage and fed on white bread and separated milk. It is a remarkable and interesting fact about children's teeth that not even one per cent. comes through the gum showing any visible defect. There are about two children

¹ Rickets (probably including dental caries) is due primarily to lack of the fresh green food and its derivatives, with which our children are inadequately supplied, because coal smoke cuts out, say, 40 per cent. in and near our cities of the sunlight by which plants grow, and because our crops are deprived of the ammonium sulphate, which is far worse than wasted when soft coal is barbarously burnt, instead of being first sent to the chemist to ransack for its fertilisers and other innumerable treasures.—Dr. C. W. Saleeby, *Manchester Guardian*, May 17th, 1920. (The remedy suggested by him is the substitution of gas and coke for soft coal, as New York has done.)—Ed.

² *I.e.*, under- or ill-development.—Ed.

in a hundred with some teeth defective on eruption, but of these it is only two or three teeth that are affected. Accordingly, we may say that only a half per cent. of the teeth erupted are of such a defective nature that they might conceivably favour the lodging of food and, consequently, the onset of decay. Moreover, statistics do not appear to show that there is any particular connection between rickets and carious teeth, at least if we accept such authorities as Denison Pedley and Norman Bennett.

CROWDED TEETH—A SUGGESTION.—As to the crowding of the teeth, we might be inclined to ask, was this lack of exercise due to the soft food, associated with the abnormal, lethargic, and unhealthy conditions that rickets produces?

HUMAN AND PUPPIES' TEETH.—In another way, human teeth seem to be very different from puppies' teeth. The former have been analysed from a chemical point of view by the best experimenter ever known in dentistry—Dr. G. V. Black—and his findings were confirmed by Sir Charles Tomes. I heartily agree with all the facts that Mrs. Mellanby has brought forward, but they do not seem to have any connection whatever with the teeth of human beings, or with the incidence of dental caries.

LOWER INCISORS.—Mrs. Mellanby specially referred to the defective nature of the lower incisor teeth. One of the characteristics of these teeth in man is that they, more than any other teeth, resist dental caries. If an old person is found with a few teeth they will, in all probability, be the lower incisors and the lower canines. These are recognised as being the *least* susceptible to dental caries. There is a simple explanation. The form of the teeth does not tend to make the food lodge about them, nor does the teeth sliding through bread, or other food, do anything but tend to clean them.

WHEN TEETH DECAY.—Mrs. Mellanby seems to think that a defective calcified tooth is more liable to decay. There is no evidence of such being so. Indeed, quite an interesting case shows almost the reverse. It is where the upper lateral incisor, an extremely well-formed tooth, has thick ridges of enamel, and consequently a little pit or crevice on the

lingual service. Only when the ridges of enamel are well developed do you get decay in these teeth on the lingual aspect.

WISDOM TEETH.—Similarly, beautifully formed wisdom teeth almost invariably decay. People seem to think that wisdom teeth have no right to come—that they are just a nuisance because they are “last to come and first to go.” There is, however, a curious exception: if they are mere peg-shaped teeth it does not matter how good the enamel is nor how bad, they are the only wisdom teeth likely to remain free from decay, because they are small teeth without deep crevices in which food can lodge.

VITAMINES.—Mrs. Mellanby referred to the fact that little vitamins seem to be required—about 2 cubic centimetres of milk. Does she think that children are deprived of vitamins to anything like the proportion that one would expect to get from 2 cubic centimetres of milk?

A DISCIPLE'S TESTIMONY.—Dr. MARION COCKERELL, Medical Officer, Argyle Square, King's Cross, Infants' Welfare Centre: We have been reading and absorbing wisdom from the writings of Dr. Harry Campbell, Dr. Sim Wallace, and Dr. Wheatley, and it seemed to be an excellent opportunity of hearing them all, so the Superintendent and myself have come from London. The papers made us realise the importance of the work that we might do in preventing dental caries among our children.

METHODS AT AN INFANT WELFARE CENTRE.—At our centre we have a good dentist, and we are also keen on the operative side of the work. Special attention is paid to the teeth of expectant and nursing mothers. We see dreadful mouths, and our mothers are not afraid of the dentist. They have great faith in her, and get their mouths patched up as well as she is able to do it. Yet, of course, when she has finished they are simply patched-up wrecks. When that is done we generally impress on the mothers the importance and the great hopefulness of bringing up their children so that they may have much better teeth than they themselves have.

DIETARIES.—We have not been much concerned with rickets, because we find that if our advice is taken they do not get

it, or only in so slight a form that it does not lead to dental caries.¹ The advice that we give is a direct result of the teaching of Drs. Campbell, Sim Wallace, and Wheatley. We discourage the introduction of any soft food into the infant's diet. As soon as the first teeth appear, at about six months, we advise hard crusts or baked bread, and later bread with a little dripping or butter upon it. The babies like the crusts and nibble them up, and we seldom have any complaint of their swallowing chunks. We do not recommend bread and milk, or porridge, and they do not get any soft food at all, if our directions are followed, until they are well over a year old. When, later on, they have milk puddings, we suggest that they be made stiff.²

SUGAR AND SWEETS.—We try to reduce the use of sugar to a minimum. The elimination of sweets is a difficult matter, as there are so many indulgent fathers and casual friends. Even if the mother can resist the temptation of the sweet-shops she has to pass when out with the children, the father on Saturday night will bring back chocolate. We have started keeping records of the results of diet on caries, adenoids, and enlarged tonsils, but find it difficult to estimate the quantity of sweets eaten by children. I should like to hear from Dr. Wheatley how he can estimate whether a child has few or many sweets. There are a good many mothers who certainly do not themselves give any sweets to their children.

A SCHOOL DENTIST'S EXPERIENCES.—Mr. PERCY ASHTON,

¹ Clinical evidence points to rickets as being a dietetic disease. I am not, however, without further evidence inclined to accept the view that it is due to the absence in the diet of an accessory substance. The dietetic fault cannot be an all-round deficiency, seeing that rickets is, if anything, commoner in over-fed than in under-fed children. The cause, in my judgment, is rather attributable to an ill-balanced diet, more particularly one containing a relative excess of carbohydrates.—Dr. Robert Hutchison, quoted in the *Medical Press*, February 28th, 1920.—Ed.

² As to diet after weaning, the transition from liquid to solid food should not be *via* pap food, as this was bolted without proper mastication and insalivation. By 1½ years of age, with normal dentition a child should be able to masticate an apple, while from 2 to 5 years a child should be capable of masticating any hard food. The County Council classes in their syllabus advised a diet which was almost entirely of pap food, and yet insisted on the importance of mastication!—Dr. Handley-Read, L.D.S., London Association, Medical Women's Federation, February 15th, 1921.—Ed.

L.D.S., School Dentist, Leicestershire County Council: I have been examining and treating children's teeth for four or five years as a school dentist, and have marked exactly the position where decay was commencing. In a large number of cases I have noticed dental caries in its initial stage on plain surfaces, such as the tops of cusps, etc. In a great many dirty mouths the teeth, although continually covered with starchy and sugary matter, are free from disease. On the other hand, parents ask why their children's teeth are so bad, in spite of the regular practice of oral hygiene. This fact, recognised in textbooks, entirely rules out the contention that decay of the teeth is due to no other cause than the collection of food débris on them. In order to assign a definite reason for dental caries you must have one which will explain every case.

RECONCILING CONFLICTING VIEWS.—Mrs. Mellanby's investigations have a considerable bearing on the subject, and will, I believe, supply the unexplained reason why clean teeth often decay and dirty ones do not. Let us combine Dr. Sim Wallace's view with what Mrs. Mellanby has told us, and we can formulate a theory for dental caries which will explain every case.¹ I give it you, as food for thought, as follows: Dental caries is due to some change taking place in the enamel of a tooth, which renders it more liable to be attacked by acids of the mouth.

¹ The conflict of ideas with regard to *how* fats may help to prevent the inception of dental caries should not be allowed to obscure the similarity in practical recommendation which follow from either Dr. Sim Wallace's theory or that of Mrs. May Mellanby. Mrs. Mellanby advocates fats which contain the vitamin fat soluble A because of certain influences on the development of the teeth, while Dr. Sim Wallace advocates fats for a different reason. Thus in *The Cause and Prevention of Decay in Teeth*, 1900, pp. 9-10, he says:—

"The physical properties of fats in acting as lubricants to the foods taken with them are probably of some importance. I have made numerous observations which seem to indicate that the relative freedom from caries among people who eat much fat is out of all proportion to what one might expect if one considered fat as neutral in its action on the teeth. Nor do I think that we can account for this freedom from caries in fat-eaters by the fact that these people may eat relatively less carbohydrates. That eating of fat is not conducive to caries, if it is not positively inimical to it, has been proved by experiment by Dr. Miller, independently of any observations I have made. It may further be mentioned that races which subsist largely on fats are peculiarly exempt from caries, *e.g.*, Icelanders and Esquimaux."—Ed.

HOW DENTISTS DIFFER.—I cannot agree with Dr. Sim Wallace when he says that dental caries is conclusively proved to be a filth disease and nothing more. If all children were brought up from the time that they first had teeth till the end of life on his diet, no guarantee could be given that they would never have dental caries. There is a great deal in heredity and also in the theory advanced some years ago that the disease is contagious.

A PROFESSION'S IDEAL.—If I am right we must concentrate all our efforts on young children, put their mouths in order, and keep them so throughout life by an organised and efficient system of school and public dental service. Were this done, the next generation would have slightly better teeth, and we should in time attain the true ideal of our profession, which is to destroy itself, or practically so.

A POLISH CONUNDRUM.—Dr. HARRY CAMPBELL: With regard to any resisting power of the teeth and the part played by their environment, I am a firm believer in the influence of oral hygiene, on which Dr. Sim Wallace has laid so much stress.

Now, I see a large number of Russian Poles. They come over here with splendid teeth, not merely regular and strong, but beautiful. That is entirely due to their pure diet of black bread, with plenty of fruit and salad. After a few years of London diet their teeth go bad. If this is not the result of our diet, which leaves the mouth in a filthy state, what is it due to?

ADENOIDS AND JAW DEVELOPMENT.—Again, people with adenoids¹ cannot breathe through the nose properly. This interference with the proper development of the upper jaw

¹ Dr. Harry Campbell, who is in general agreement with Dr. Sim Wallace, differs as to the origin of adenoids. The latter has been compelled, by observation among his patients, to abandon the theory still held by Dr. Harry Campbell, which connects adenoids with insufficient mastication and intestinal indigestion, due largely to excess of starchy food, taken in unduly soft form, which does not excite mastication. Dr. Sim Wallace attributes adenoids to exposure to cold and damp air at night and to defective ventilation by day. Writing some years ago, he said: "I do not *altogether* exclude the food factor in the causation of adenoids." Dr. Harry Campbell opened an interesting discussion, in which Dr. Sim Wallace took part, at the Royal Society of Medicine, January 24th, 1919.—Ed.

is shown by the fact that if you block up a nostril the corresponding side of the jaw does not develop properly. Thus adenoids prevent the development of the upper jaw, not only in the way that Dr. Sim Wallace has suggested by causing the tongue to be low, but also by preventing the twenty odd thousand currents of air passing through the nose in the twenty-four hours.

RICKETS AND DENTAL CARIES.—Mr. JAMES MCGHEE, St. Helens: If rickets has any connection with dental caries, how is it that the symptoms of the former cease about the age of five to six years, whereas dental caries increases as age goes on?

A PUZZLED S.M.O.—Dr. ARTHUR G. WILKINS, Senior Medical Inspector, Staffordshire County Council: As a school medical officer, I should like to know why many thousands of people whose teeth are very dirty and who never cleaned them in their lives have teeth which do not decay, whereas many families whose members clean their teeth and carry out every fad described have to go to the dentist every two or three months. I do not think that the partial explanation given by Dr. Sim Wallace is altogether consistent with the facts.

THE DOMINANT FACTOR IN CARIES.—The CHAIRMAN: Of all the factors that may be concerned in the production of dental caries, every one has insisted upon a proper diet, although he may have had some other view as to the essential cause. It is of importance that we should know the effects of the world shortage of food on the prevention or production of dental caries. When the results are co-ordinated, as they no doubt will be, this ought to give us information of the utmost value. There is a consensus of opinion that the dietetic factor, no matter what other may be present, is the dominant one.

HOW THE EXPERIMENTS WERE CARRIED OUT.—Mrs. MELLANBY, replying on the discussion: On the whole the health of the puppies was good, although several outbreaks of distemper and mange occurred. In the case of the animals on the deficient diets, these diseases were much more severe, for they had poor resistance. In comparative experiments all

the puppies had the same amount of exercise, as far as could be arranged. When rickets develops, it is difficult and sometimes impossible for the animals to get real exercise, even though they may be allowed much freedom. The diet in all cases was pappy. In the earlier experiments the diets were continued until the animals were killed. The experiments usually last from three to six months.

VISIBLE AND INVISIBLE DEFECTS.—Dr. SIM WALLACE said that only about 1 per cent. of children showed hypoplasia affecting the enamel in their temporary teeth. I assume that he refers to obvious hypoplasia. I understand from an eminent dental histologist that deciduous teeth often show many small interglobular spaces—a type of hypoplasia of the teeth not observable by simple inspection.

LIABILITY TO DECAY.—Dr. Sim Wallace also referred to the conclusions of Black and Tomes that the chemical and physical nature of the teeth is not related to the tendency to decay. He ignored, however, the conclusions of Pickerill, who has done valuable work on this subject and whose views are opposed to those of Black and Tomes.

I cannot discuss the question whether teeth with normal or defective enamel are the more liable to caries. After reading the literature on this subject it seems certain that more work will have to be done before the problem can be settled.

SUBJECTS OF THE EXPERIMENTS.—In illustrating the potency of vitamines I referred to the addition of 3 c.c. of milk affecting growth, as shown originally by Hopkins. Young rats, of course, were used in these experiments—not children.

VITAMINES AND CARIES.—The absence or presence of vitamines, and especially vitamine X, does not explain the whole problem of defective and sound teeth. This substance is certainly of importance, but there are many other factors which exert an influence—some known and others yet unknown. Abundance of vitamine X, relatively to other foodstuffs, where it can participate in the metabolism, increases the power of the body to lay on calcium in teeth and jaws. Whether or not it plays a part in antagonising caries is another matter.

WORK OF DENTAL CLINICS.—I was greatly interested in Mr. Ashton's remarks. Much can undoubtedly be done, and is being done, in these clinics. Those established for expectant and nursing mothers are of special value.

TEETH IN CENTRAL EUROPE.—It will be instructive to secure particulars regarding the state of the teeth in Germany and Austria, since there can be no doubt that the fat deficiency has been acutely felt there.

HIGHLANDERS' DIET.—The Highlanders not only take porridge, but many other foods. Recently their teeth have not been so good. Possibly lack of vitamins may be one reason for this, since their food is now far more artificial than formerly.

CARIES AND RICKETS.—I did not say that caries could be obviated by preventing rickets. When, however, you get rickets and badly formed teeth you may have one of the predisposing factors to caries.

EFFECT OF ILLNESS.—As to caries following on a prolonged illness, it is surely admitted that people's tissues at such a time are less resistant to bacteriological infection.

THUMB SUCKING.—Thumb sucking may tend to cause greater irregularity of the teeth when the jaws are soft.

VITAMINE ABSORPTION.—Little is known as to the powers of the digestive system under varying conditions to absorb vitamins.

PLEA FOR INCREASED CO-OPERATION.—I naturally welcome the criticism bestowed upon my paper, and hope that in future dentists, doctors, physiologists, and biochemists will work more in co-operation and harmony.

THURSDAY, MAY 13th.

EVENING SESSION.

AN EDUCATIONIST'S TESTIMONY.—CHAIRMAN, Councillor CAROLINE HERFORD, J.P. : It is an honour and a great pleasure to take even a small part in this important Conference. Any one who has the good fortune to come in contact with boys and girls, especially young ones, will realise that there is a close connection between their condition, both intellectual and

moral, and their digestion. We all know that one of the factors in good digestion is good dentition, a healthy state of the mouth and teeth; therefore there must be a close connection between the care of the teeth and the general well-being of our young people.

PREVENTION VERSUS CURE.—We are to have a paper from Dr. Harold Waller on the early stages of child-life. It has been the custom in the past, and I regret that it is still prevalent, to pay more attention to trying to mend matters when they are wrong, than to preventing the wrong ever happening. (Hear, hear.) In questions of health, as the level of general education rises, it will be evident perhaps more than in any other direction in the energy thrown into preventive work. It will be found to be more economical to prevent than to patch up afterwards. It may not be so easy to advertise, it may not be so attractive to many people, but it is certainly a sound way of attacking this problem. Let us hope, therefore, that an increasing number of people are going to work for preventive measures. Are there any such measures more important than those which deal with the welfare of the young child? As the young child is studied, its development is traced back until we come to the mother and the conditions at birth and before birth. This subject, which vitally concerns the well-being of the community, is in the able hands of Dr. Waller.

INFLUENCE OF DENTAL DISEASE IN PREGNANT AND NURSING WOMEN.

By HAROLD WALLER, M.B., B.C., M.R.C.S.

DISEASED TEETH IN NURSING WOMEN.—The readers of other papers are dealing with various disorders of the teeth, their causes, prevention and treatment. My purpose is to bring to your notice a single clinical fact, one of the many effects of neglecting dental hygiene. It is a complication which has come to light in the study of infants and, against the slender contents of my contribution, I would urge its peculiar interest. For we find that, in certain cases, diseased teeth in a nursing woman are capable of disturbing the health of her baby at the breast.

CAUSE AND EFFECT.—It is not always possible to trace in the child bad effects of dental sepsis in the mother. From the point of view of the reformer this is perhaps unfortunate. On the other hand, it is fortunate for the country, because mothers with defective teeth are more numerous than mothers with sound teeth.

DISORDERS OF INFANCY: A COMMON ORIGIN.—I need scarcely remind you of the extreme importance of successful breast feeding in the welfare of babies. Sooner or later, every worker at the problems of infancy comes back to this. The more one studies the disorders of health in young children, the more they converge and point to a common source of origin—some interference with nutrition in the early months of the first year of life.

UNEXPECTED HUMILITY.—Indeed you may have observed a note of almost startling humility which has latterly found its way into some of the advertisements of patent foods for infants. One reads that the natural method of nursing a child is actually worth a trial before resort is had to artificial feeding. True, the advertisements are framed to suggest that lactation is almost sure to fail. Yet the admission that breast milk has even a limited field of usefulness is a concession.

BREAST FEEDING: AN INQUIRY.—It was interest in the fact that, for one reason or another, breast nursing does, quite often, come to an end before it should, that prompted inquiry into the causes of failure. That inquiry is difficult and has not gone very far, but ill-health in the mother showed itself early as deserving special investigation.

DENTAL DISEASE: ITS FAR-REACHING EFFECTS.—In the dockyard neighbourhood of East London are to be met frequently, as no doubt in Manchester and the great manufacturing cities of the North, women of poor physique and unhealthy appearance. The peculiar features of town dwelling, its bad housing, smoky atmosphere, fatigue and noise, no doubt contribute something to the appearance of the inhabitants. Yet, after allowing for this, after eliminating grave illnesses like tuberculosis, and renal disease, and such causes of chronic invalidism, after ruling out enfeebling influences, such as shortage of food,

overcrowding, unhealthy occupations and industrial fatigue, there still remains a considerable number of ill-nourished, sallow, dyspeptic invalids, who often complain of headache, neuralgia, pains in their limbs and joints, loss of weight, and, perhaps, describe themselves as anæmic.

Town dwelling will not account for their condition, for they are frequently found in country districts. Careful search will often reveal the existence of a gross degree of disease in the teeth, while if adequate treatment is procured, the extraordinary difference in strength which results, suggests that their general health has been lowered much below normal by reason of long-standing poisoning through the mouth.

A CAUTION.—Careful investigation is necessary before attributing ill-health to the condition which exists in the mouth. It is quite possible to become too enthusiastic in one's promises about what will happen if an unhealthy tooth is extracted. Such enthusiasm has sometimes recoiled on the physician to his undoing. It may, however, be stated without fear of contradiction that, even if the ill-health is not primarily due to dental disease, the patient's condition is in no way helped by having the mouth grossly septic. In the present state of tolerance to the existence of disease of the teeth, it is wise not to be more iconoclastic.

POPULAR IGNORANCE AND APATHY.—Most people are not even dimly aware that bad teeth are sometimes responsible for a loss of general health. Many will cling to their hollow molars and loosely rocking incisors with a gloomy pride of possession that nothing can gainsay. Others will stoutly deny any experience of discomfort, though one may have seen them tortured with pain and disfigured with facial swelling. A suggestion that treatment should be undertaken will, in consequence, commonly be met with distrust and refusal.

This Conference should do much to spread a truer knowledge of the value of dental hygiene. When that knowledge has replaced the present indifference, the importance of healthy teeth in nursing women will receive the attention that it deserves.

A REMARKABLE CASE.—Let me give you an example of the way in which an extreme case of neglect may manifest itself. You see on the screen a chart such as is used to record the progress of an infant's weight during the first year of life—the horizontal lines denote 4 oz., the longitudinal lines, a week. Pounds and months are indicated by thickened lines. Across the chart in a diagonal direction runs a line which has been found by experience to indicate the average progress of a baby's weight from birth to the age of a year. Such progress demands freedom from illness, an adequate supply of suitable food, proper care, warmth, exercise, ventilation, and so forth. In addition to the line indicating average and uninterrupted progress, there is plotted the weight of a very interesting child. This baby was the first-born of a woman twenty-two years old, and was brought to the consultation when three weeks of age, on account of persistent and forcible vomiting of the breast milk and most pitiful screaming. Notice, first, that the weight is much below the average. The child, indeed, was undersized. It was also wasted: the normal layer of fat beneath the skin was deficient; the skin had an unhealthy sallow tinge and the circulation was much disordered, as evidenced by the purple hue of hands and feet. The way in which the child took the breast showed it to be ravenously hungry, yet by weighing before and after the feeds, it was clear that the hunger was not due to any marked shortage of milk. The milk had flowed easily and abundantly from a day or two after the infant's birth. To what then could the wasted condition be due? Towards the end of a breast feed, lasting about ten minutes, the child began to show signs of discomfort. At first, he paused in the act of suckling and displayed writhing movements of the trunk and limbs, accompanied by whimpering. As the pain passed off he returned to the task of feeding. A series of similar interruptions recurred and then gave place to a bout of screaming and absolute refusal to continue suckling. The mother, only too familiar with her baby's behaviour, foretold that vomiting would follow. A few minutes later a meal of apparently 3 oz. or 4 oz. of milk was forcibly rejected by the stomach. The baby, considerably exhausted, fell asleep, only to wake and cry with hunger a little later.

TWO POSSIBLE EXPLANATIONS.—There are but two reasons that can account for this state of affairs. Either the infant's digestion must be so out of order that it cannot deal with food, even when the most suitable. Or else the food taken is unsuitable, and is disturbing a digestion which would otherwise function properly.

DEATH-DEALING MILK.—In this case it needed some care to decide which was responsible, the baby or the food. Certain evidence, however, pointed to the milk being at fault and not the child. Was it possible that the woman was yielding a copious supply of milk which, instead of nourishing her child, was so unsuitable as to provoke vomiting and lead to its starvation? It would be a most extraordinary occurrence if, after all the complexity of gestation and delivery, the child should be thus destroyed by its mother's milk.¹ Nevertheless, I believe that, but for the dental surgeon, destruction would have been its fate if breast feeding had been continued.

THE GUILTY MOUTH.—For this woman's mouth was in a deplorable state. Nearly all the teeth were carious: several were dead: pus was pouring into the mouth from abscesses at the roots of the teeth, the gums were acutely swollen, loose where they should have been attached and bleeding freely at the lightest touch.

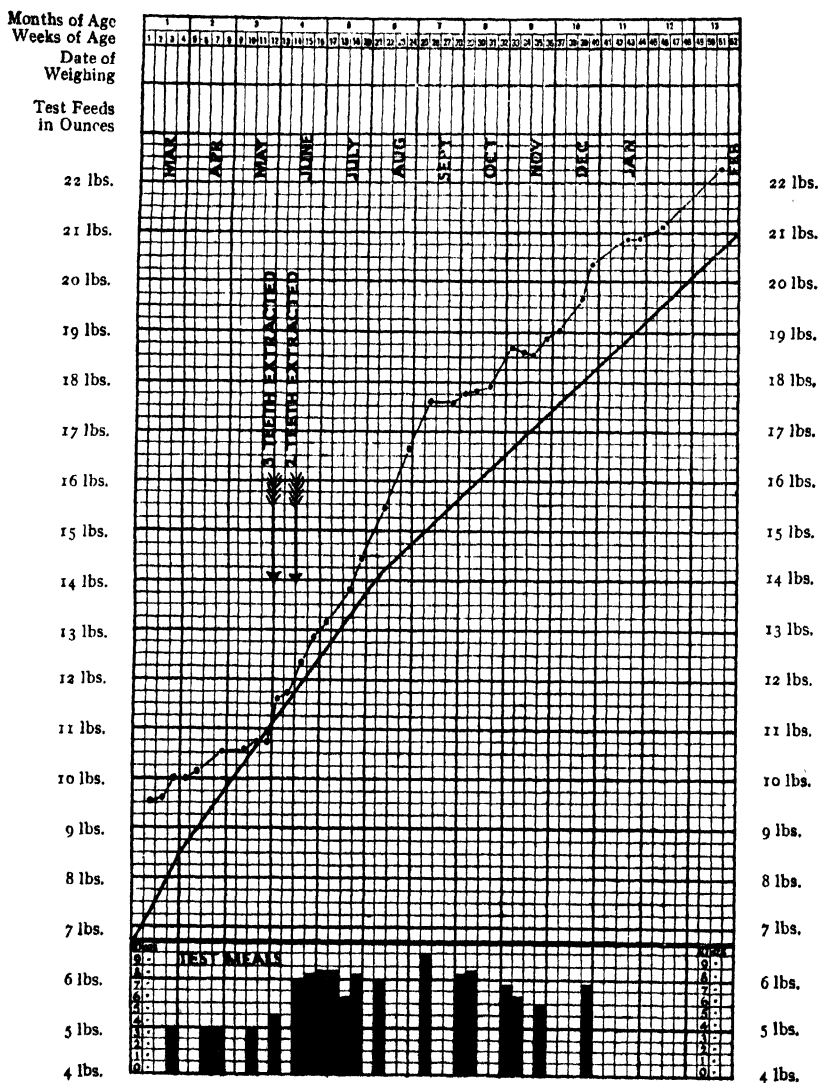
HOW A REVOLUTION WAS EFFECTED.—The dentist reported that nothing less than radical extraction would do any good. To this she agreed. It was undertaken in three stages, indicated by arrows on the chart. You will have noticed that, for several weeks after the first attendance, no gain in weight is registered, the line is practically horizontal. Within a short while of the first extraction, however, the vomiting ceased and never recurred. A rise of weight started before the treatment was concluded, but by that time the worst of the condition had been relieved. The infant's health rapidly

¹ A child arrived in a pitiful condition due to gastric and intestinal disturbance, and in course of the routine was isolated and placed under the strict system of the home. As it did not improve all possible causes were investigated. The mother was devoted to the child and was constantly kissing it. She was found to have a mouth full of carious teeth. A promise was extracted that she would not kiss the child, and her teeth were attended to. The child's rapid recovery was the sequel.—Dr. G. D. Sherwood, *Lancet*, April 24th, 1920.—Ed.

CHART B.

Case M. H.

Chart to show the improvement in an infant's weight produced by treating the mother's Oral Se psis.



NOTES.

1. The infant in this case does not appear to have suffered any ill-effects during intra-uterine life, for its weight soon after birth is above the average. This initial advantage is lost, however, by the end of the third month.

2. A marked improvement takes place in the rate of gain in weight after the dental extractions.

3. A number of test meals is recorded in ounces at the foot of the chart. Though not small at first, they increase considerably in size after the extractions.

The child was breast-fed until the age of eleven months.

improved and breast feeding continued without any interference for many months. The baby's weight may also be taken as a reflection of the improvement produced in its mother's health.

FALLACIOUS ARGUMENTS.—An objection often raised by patients who are advised to have unhealthy teeth extracted is that they cannot at the moment afford artificial dentures and are unable, therefore, to lose what teeth they possess. The objection may be made in good faith; sometimes it is made in the hope that the doctor will sympathise and allow a postponement of the dental operation. This chart shows that the argument is not really valid. The woman was actually edentulous for five months, yet in spite of that supposed handicap to digestion, she improved greatly in health. It is the *presence* of unhealthy teeth, not their *absence*, which makes for harm.

Another reason offered in support of postponement is that the patient is run-down and not strong enough to stand the operation. Here the physician, I am afraid, often concurs. Where, however, the patient is ill because extraction is needed this concession is based upon a mistake: she will not become strong until the source of ill-health has been removed. This is frequently demonstrated by the way in which dental treatment accelerates the healing of wounds, benefits anæmia, dyspepsia, tonsillitis, etc.

PROOF OF THE PUDDING.—I have plotted on the same chart the weight, through the first year, of the second child born to this woman a few years later. It certainly suggested that it had benefited by the foregoing events. Breast feeding was uneventful throughout. This case brings out exceptionally well the influence of dental disease. One does not often get such good opportunities.

ANOTHER ILLUSTRATION.—There is another chart illustrating much the same sort of thing. This child at two weeks old was considerably heavier than the average. It was a strong, well-nourished child but, as you will notice, it failed to thrive as might have been expected. Indeed, by the twelfth week all this initial advantage has been lost and the baby is of average weight only. Had it continued at that rate,

it would soon have been greatly below normal and well within the danger zone—14 lb. at one year—its destination had nothing worse befallen it. The arrows show when dental treatment was obtained for the mother. She was in great pain from an abscess at the apex of an incisor tooth and was thankful for the relief. Nevertheless, I owe the existence of this chart to the fact that she withheld all mention of her suffering for some weeks, while I did not at the time attach enough importance to it. Improvement in the child's weight follows extraction, and shows that during the early weeks it was being depressed below the normal. At the back of the chart is shown a series of test feeds taken at various intervals when the woman brought her infant to the consultation. The steady increase in size may be taken as an indication of her gain in health.

AN ANALOGY FROM THE COW.—This is quite consistent with a point of much practical interest in dairy farming. It is proved that cows will yield a greater quantity of milk if protected from the pain and irritation of stinging flies. The yield is higher where a chemical spray is used which guards the animals from these pests. To nursing women suffering from toothache, the dentist brings something of the same relief. Probably most people here have, at some time or another, suffered from toothache and could bear witness to the loss of sleep and strain on the nervous system often involved.

Such results are not commonly obtained. For one reason the woman is nearly always recommended to stop nursing in the interests of her own health, if she is ill; in the interests of the child if the latter does not thrive. If the artificial food prescribed is at all suitable, the baby will show instant improvement. The advice will, therefore, seem to have been right. It does nothing, however, to improve the woman's health, nor to eliminate the reason why breast feeding failed. Cases of this kind merely serve to foster the opinion that, for unknown causes, lactation is impossible in many young women.

CHRONIC DISEASE.—More commonly the disease is of a chronic kind, to which the patient has become, so to speak, acclimatised. This power to resist the effects of poison occurs in

many infections, but it is not a fact on which to place too much reliance. Something happens which temporarily lowers resistance. It may be exposure, or another form of infection, or an injury, and the local disease in the mouth becomes more acute. In a nursing woman her resistance may remain high throughout lactation and the child be satisfactorily suckled, despite the presence of obvious dental disorder. Yet it is always wrong to let the condition pass without urging that treatment should be undertaken, for there can be little doubt that teeth may unexpectedly prove as great a source of danger as was his heel to Achilles.

REJECTED ADVICE.—A woman of twenty-seven was recommended to attend the dental surgeon for the extraction of two carious and three dead teeth. Pus was entering the mouth from two of the latter. Her infant was two months old and was thriving at the breast. She refused treatment, saying that she suffered in no way from her teeth, and had successfully nursed two children previously. When the child was three and a half months old this woman had "influenza." She was confined to bed with a sore throat, shivering and pains in the joints. The child was put on to bottle feeds. A month later she had acute swelling of the face and intense pain. This was followed by pleurisy and an empyema—an illness lasting over three months. The baby died of unsuitable bottle feeding while she was in hospital.

ANOTHER INSTRUCTIVE CASE.—The advice to have several unhealthy roots removed from her mouth was also refused by a woman nursing her $3/12$ old infant. The child was above the average in weight and thriving. The mother stated that she was in good health and ailed nothing. When the child was $6/12$ old she brought it again for advice. Breast feeding had ceased at five months, when the woman was ill with "flu and a chill," which kept her in bed for two weeks. She was complaining of pains in her joints and had not regained strength after her illness. She was again advised to attend the dentist, but declined. The child's feeding was directed. Three months later the mother was in hospital with arthritis of the knee, wrist and ankle. She was treated by the hospital dentist and recovered. She has since nursed a baby at the breast with success and has had no illness for the

past five years. She now realises her illness was a blessing, for she "never knew what it was to be well."

PHTHISIS OR DENTAL DISEASE ?—A woman of thirty-six, of feeble appearance, brought her child, aged 6/12, for advice. It was being partially bottle fed, as breast feeding was failing. This was her usual experience. Of five previous infants :

First had been breast fed two months—bottle.

Second had been breast fed four months—bottle.

Third had been bottle fed from birth—(a premature child).

Fourth had been bottle fed from two weeks—(premature).

Fifth had been breast fed for two months—bottle.

This patient had attended a tuberculosis dispensary for seven years under suspicion of having phthisis, but she was never definitely labelled tuberculous. Of her five children three had died and she had had at least two miscarriages. She was advised to attend the dentist without delay ; there were only the remains of about eleven teeth in her mouth and none were healthy. She nursed her sixth child at the breast for eight months and it was then of average weight. Her own health improved greatly. Her weight increased ; examination of the sputum failed to detect the T. bacillus and X-rays confirmed the impression that she had not suffered from phthisis.

It would be possible to quote many examples from the women who attend our consultations in East London. I would rather urge that it is not the dramatic cures we should seek. They are fascinating, if they happen to turn up, but they are much too near disaster to come within the category of true preventive medicine.

EVIDENCE OF PROGRESS.—We are far prouder of the fact that we already need two more dental surgeons where, a few years ago, we had only one. When he first attended, only a small proportion of the patients recommended to his department ever put in an appearance. Quite a large number attend for treatment during pregnancy.

DANGER OF DELAY.—I would emphasise the desirability of attacking the disease as early as possible. If dental sepsis is capable of influencing health so profoundly as to cause general debility, or acute illness, there is no reason why these effects

should be conveniently postponed until after labour. They do, in fact, not infrequently manifest themselves during pregnancy and they may, in certain cases, be responsible for the birth of weakly children. You will remember the infant whose chart I showed you first was much below the average in weight at birth.

GRAVE SUSPICION.—Can we go further? Is the condition that we are considering ever responsible for death of the fœtus, leading to abortion or miscarriage? I have no evidence to justify the statement, but the obstetrical history of many of our dental patients is very suspicious. The miscarriage rate is high and they commonly have given birth to premature children, or weakly babies who survived but a few weeks. That is, however, far from being enough to say that the association shows cause and effect.

SOUND TEETH AN ASSET FOR NURSING MOTHERS.—It is a line of investigation that deserves to be worked out, especially as the opposite seems to hold good, that women with sound teeth commonly nurse their children without difficulty and rarely miscarry. I do not suggest more than that sound teeth are a great asset for good health.

A VICIOUS CIRCLE.—In this last direction lies our most likely chance of effecting an alteration in the national attitude. That it has been disastrously lax in the past no one can doubt. There are, I know, nothing like enough dentists to deal with all the existing dental disease. This is largely, however, because scarcely anybody has appreciated the importance of having a healthy mouth and because we allow our children to grow up with teeth which have no chance whatever of keeping free from disease.

CHANGE OF ATTITUDE WANTED.—We must concentrate on prevention, and enough is known nowadays to make this a practical possibility. As a first step, people must be taught to be disgusted at the presence of a decayed tooth and an unsightly mouth as they are by the neglect of bodily cleanliness. The worst feature is our tolerance. We have lost a sense of pride in good teeth; many of us have never had a chance of experiencing this feeling. It is not necessary to

mock the afflicted, but it is of paramount importance that good teeth should be considered at least good form.

We should endeavour to raise the subject to a point in our esteem which insists on its inclusion in the curriculum of every school; not leave it, as hitherto, to the comic artist, who seldom does more than emphasise the less attractive aspects of the dentist's art.

PERIL TO THE RACE.—Its neglect in the case of women may, as I have shown, jeopardise the health of the next generation. This surely argues that good teeth should take their former place in the scale of æsthetic values and play an important rôle in sexual selection. The poet who, in sonnets to his lady's beauty, always found room to mention her pearly teeth, expressed sound eugenics.

The **CHAIRMAN**: Dr. Waller says he is willing to answer any questions. Being a scientific man, he adds that he will try to do so.

CARIES AND VITAL STATISTICS.—**MR. JAMES MCGHEE**, St. Helens: If dental caries and bad teeth have such an influence upon infant life, how do you harmonise the fact that dental caries has increased enormously and infant mortality has markedly decreased, at least during the last twelve years? Secondly, how do you reconcile the fact that dental caries has increased, while the general health has improved, and the length of life has certainly grown during this last fifty years. I do not altogether agree that dental caries is such an important factor in ill-health, as Dr. Waller appears to hold from the extreme change made merely by the extraction of the mother's teeth.

A POSSIBLE SOURCE OF MISCARRIAGE.—**DR. WALLER**: You have read into my remarks an inference which I took the greatest pains to try to prevent. The chart showed beyond question that the effects of the disease of the mother were passing to her child. I did not venture to say that dental caries played an active part in infant mortality. I suggest that it may sometimes be a source of miscarriage. You will not find that the birth rate of premature children has largely decreased in the last twelve years. It is still the greatest source of mortality in the first month. If we can improve the dental condition of mothers, that may be one

of the ways in which we may lower this terrible mortality. I particularly do not want to be understood as having said that unhealthy teeth in the mother always cause babies to die.

“THE PUDDING LADY’S” ANALOGY.—MISS FLORENCE PETTY, M.C.A. (“The Pudding Lady”): I have not much to say, except to express my warm appreciation of Dr. Waller’s paper. Most of you will agree that this question of teeth bulks far more largely in the minds of mothers than formerly. A year or two back I was in Edinburgh, and the head of the health visitors’ department was feeling a little bit hopeless in regard to the mothers’ knowledge of food. She had gone round with another of the visitors to two hundred of the houses and said that though she found their condition good, the windows open, the houses clean, and all the babies, with about two exceptions, had separate cots, there was not one woman who knew much about cooking, and few had any meals cooked at home.

I pointed out that it was one of the most encouraging experiences she could have, because all the health work had been done along those hygienic lines, and it showed that the lessons had been absorbed by the mothers and put into practice. There were, however, few health visitors who realised that to get others to understand this question of food and its cooking was a vital part of their work. It is just the same with the teeth. I am hoping that progress will be just as rapid along these lines as it has been along the hygienic.

A REMARKABLE PLEBISCITE.—I go to a great many women’s institutes all over the country, and when they are to have a lecture it is put to the vote what subject they want. I was going to the Kesteven Division of Lincolnshire last autumn and offered to give a demonstration in cooking,¹ with a lecture on food at the same time, or a lecture entirely on teeth—“Food in Relation to the Teeth.” Seven out of the eleven institutes voted to have a lecture on teeth. This shows a great advance. (Hear, hear.)

¹ Such cookery demonstrations and lectures have been given under the auspices of Education, Insurance, Public Health and Child Welfare Committees, or arranged by individual social workers. Particulars may be had from the Food Education Society, Danes Inn House, 265, Strand, W.C.2.—Ed.

AN EXAMINATION PAPER FOR MOTHERS.—I have lately given several demonstrations in an infant welfare centre on simple cookery—the utensils were simple too (only a biscuit tin for an oven). The superintendent tells me that there is not a mother attending that centre who is not exceedingly interested in the question of food, and especially the teeth. I asked if any of them would answer questions on this subject if I sent a paper. I set about seven questions, and they had to answer four out of the seven. They were on these lines : Why was it necessary to chew food ? Why was it wrong to give children anything to eat between meals ? Why was it a good thing to give a child plenty of water to drink between meals ? Why was it a mistake to cook vegetables in a great deal of water ? That was answered best of all. Why should some portion of our vegetables and fruits be eaten raw instead of cooked ? The answers were really wonderfully good. It is indeed a hopeful sign that so much interest is being taken by the mothers all over the country in this problem of food and the teeth.

A GOOD WORD FOR THE DENTIST.—Dr. WALLER : All extractions at our centre are done with gas, or gas and oxygen. It is only in exceptional cases that the dentist takes out teeth without an anæsthetic, and I have never known any ill-effects of giving gas to pregnant women. Our dentists are extremely efficient and all their extractions are done with skill, so that the shock of the operation is reduced to a minimum.

Miss FLORENCE PETTY : I never found a mother who would not go to the dentist, as long as I undertook to stand and hold her hand.

MASTICATION AND BRAIN DEVELOPMENT.—A MEMBER OF THE CONFERENCE : Has mastication any effect on the development of the brain ?

Dr. WALLER : I cannot answer off-hand. I must have notice of a question of that sort. (Laughter.)

Mr. CHARLES E. HECHT : I do not know about mastication stimulating the brain, but Dr. Harry Campbell has suggested, I believe, that at any rate it has a reflex action on the development of the outer part of the brain.

NEED FOR CO-ORDINATION.—Miss MARION FITZGERALD : It

seems necessary for the success of dental treatment that the clinics should be under the same management as the centres. In Woolwich we had a great many cases needing treatment, but nowhere to send them except to the Dental Hospital in London or to private dentists. The result was that the mothers seldom went, although the medical officer urged them strongly to do so. Will Dr. Waller tell us how we can best get dental treatment in connection with the centres, so that the mothers may be encouraged to go?

DENTAL CLINICS.—DR. WALLER: I do not know quite how you can get dental clinics started. The Ministry of Health is unfavourably impressed by their cost. They will make a grant of 50 per cent. of your expenses.¹ That includes the cost of denture. It is an advantage to have them under the same influence as the consultations. Dental hospitals are few and far between and dentists too, and unqualified dentists are a drawback. The whole problem is very difficult. We have got to wait until the subject is more appreciated, and then the difficulties will diminish.

DIET AND CHILDBIRTH.—MISS MAY YATES, Hon. Secretary, Bread and Food Reform League: Has Dr. Waller any experience as to whether diet has any effect in easing the pains of childbirth? When in Sicily I was much impressed by what I was told by the friend with whom I was staying, that the women there would have a baby and in about a couple of days be at the washtub.

DR. WALLER: The mother is likely to suffer less if she is in good health, and she is more likely to be in good health if she is eating proper food. The practice of returning to

¹ The Ministry of Health class expenditure on dental treatment of mothers and young children as ranking for their 50 per cent. grant, including the cost of providing artificial teeth where the mothers are unable to pay the whole of the cost. Nursery schools also give an excellent opportunity for the work. The St. Pancras School for Mothers, besides leading the way in this country in the institution of child welfare centres, can also claim credit for pioneer work in the association of such centres with dental treatment. Since 1913 it has had a dental surgery upon its premises, where Mr. Geo. Thomson, L.D.S., has dealt with mothers and children. The St. Pancras Borough Council in April, 1918, opened a municipal dental clinic for mothers and young children at the British Dentists' Hospital, 31, Camden Road, N.W.—Dr. Shadick Higgins, M.O.H., St. Pancras, *The Child*, May, 1919.—Ed.

active life soon after labour is one which varies a great deal in different parts of the world.¹ There are many factors entering into it. I am not sure that anybody has proved that it is a good thing for the Sicilian or the Indian woman to be at the washtub two days after childbed. The English custom of allowing at least ten days is an improvement. Many women could not possibly do it without losing their health permanently.²

The CHAIRMAN: As Dr. Waller has so kindly answered each question as it has arisen, there does not seem to be any summing up for him to do.

FRIDAY, MAY 14TH.

MORNING SESSION.

ENGLISH AND GERMAN METHODS CONTRASTED.—The CHAIRMAN: GEORGE G. CAMPION, L.D.S., Manchester: Individuals and those groups of individuals that we call communities and those groups of communities that we call nations, all alike are burdened with the defects of their qualities. A nation like ours, which has spent a thousand years in battling, in ever-widening circles, for what it is pleased to call freedom, is not one which easily allows itself, in the ordinary relations of life, to be subjected to any severe process of control. That fundamental is one of the reasons for our Conference here to-day. In Germany, before the war, a great deal of the work which we want to see done was done by imposition from above.

OBJECT OF THE CONFERENCE.—The object of the Conference, as Lady Rhondda said, is not to inform those of us who happen to be present. It is that the aggregate knowledge amassed here may be slowly spread all over the country, as a stimulus

¹ The International Labour Conference, convened by the League of Nations and held at Washington, 1920, prohibited the employment of women for six weeks before and six weeks after childbirth. H.M. Government have, however, decided not to ratify the Maternity Convention.—Ed.

² A valuable and suggestive discussion of the question of the employment of married women will be found in an interview with Professor Louise McIlroy, Royal Free Hospital, London, *Manchester Guardian*, February 22nd, 1921.—Ed.

to effort, by the various school and municipal authorities and by individuals.¹

A RÉSUMÉ.—Yesterday we learned from distinguished speakers, of the disastrous effects of improper and inefficient diet upon the teeth. We heard further that carious teeth in parents reflected upon the entire organism and what resulted from the septic condition in which untreated mouths are apt to get.

PYORRHŒA, OR DISEASE OF THE SOCKET.—This morning we touch upon a different aspect of the problem. Mr. Holborn is going to deal with another cause of the sepsis which invades the whole organism from the teeth. He will talk, not about septic teeth due to decay, but about the septic condition of the mouth and its influence over the system through the disease of the socket called “pyorrhœa.”

PYORRHŒA.

By F. M. HOLBORN, L.D.S.

POPULAR TREATMENT.—I have been asked to treat this subject in a popular manner. I am glad of that, as I am not competent to do otherwise. You have, moreover, many men in Manchester who are much better fitted to deal with the more deeply scientific aspects of pyorrhœa. I am only going to tell you how it strikes an ordinary dentist, who is continually having to attempt its treatment and to whom its exceedingly common incidence is a considerable nuisance.

NATURE OF PYORRHŒA.—Very few of our patients know exactly what they mean by “pyorrhœa.” Nor are they to be blamed, since that word means simply “a flow of pus,” and a flow of pus, though it is probably there in small quantities, cannot always be demonstrated in many cases which dentist and patient agree to call pyorrhœa.

Pyorrhœa alveolaris, or chronic suppurative periodontitis, to give it its proper name, is an inflammation of the membrane holding the tooth in its socket, chronic in character, and accompanied by a discharge of pus from the socket around

¹ Any one wishful to help in the campaign by bringing this book to the notice of libraries, public or private, or of local authorities, may obtain prospectus on application to the Food Education Society, Danes Inn House, 265, Strand, W.C.2.—Ed.

the neck of the tooth, which, if left untreated, results in the destruction of this root membrane, the absorption of the bony wall of the socket, and the loosening of the tooth.

AN INCURABLE DISEASE.—Again, we dentists have got too used to pyorrhœa. It is, next to dental caries, the commonest disease in this country. Ninety per cent. contract it sooner or later, if they keep their teeth long enough! We know that we can do next to nothing for the patient once he has it, except to extract his teeth. Yet, because we are so tired of talking about it, we rarely mention the slight congestion of the gum margin which precedes it; still less do we tell him what causes that gum congestion. If, however, we are going to prevent pyorrhœa, we must first prevent that gum congestion. To cure pyorrhœa once it is well established is practically impossible, since pyorrhœa involves extensive loss of gum, root, root-membrane, and bone, and these structures when once lost are not replaced to any great extent. So prevention is our only hope. To obtain this we must know and avoid the causes of gum congestion, which is so common that you can rarely find an adult mouth in which none of the gum is inflated. That is not surprising, considering how rarely we see a mouth with all the teeth perfect and in their correct positions in the dental arches.

AN ANALOGY.—Let us consider the analogy between the teeth of a dental arch and the stones of a stone one. The stones of the latter are kept in place by their contact one with another. Take out one stone and the whole arch loosens and collapses. The teeth in a perfect dental arch are in close contact one with another all the way round. Lose one or, what often happens, lose part of one by decay and an imperfectly formed filling and you lose this perfect contact for a considerable distance from that point of loss. What happens? Food at once starts to pack between the teeth on to those tags of gum which ought nicely to fill the spaces between the necks of the teeth. We must not push this analogy of arches too far, since a tooth has only one point of contact on either side, as its sides are not straight and parallel, whereas a stone in an arch is in contact all down its side.

HOW DISEASE MAY START.—So this tag of gum begins to suffer through the wedging of food upon it, which it was never meant to endure. It becomes inflamed and tender; after a time it shrinks away and makes room for more food; a line of hard, dark tartar begins to form on the neck of the tooth just out of sight below the gum, the inflammation goes on and spreads to the root membrane and the wall of the tooth socket. These structures begin to absorb, and a pocket is formed below the level of the gum where bacteria thrive and multiply undisturbed. Their poisonous products may come to the surface along with a discharge of pus on squeezing the gum and may be swallowed, or they may be taken direct into the circulation by the blood vessels and lymphatic vessels of the jaws. In either case the patient gets the benefit, and is lucky if he escapes far-reaching trouble remote from the source of infection.

ANOTHER FORM.—This is a picture of a purely local pyorrhœa. A similar one is seen where a tooth has not lost contact with its neighbours, but with its opposing teeth (through their extraction or other loss) so that it has no longer anything upon which to bite. Such a tooth, which cannot be used, at once becomes dirty, coated with food and tartar, and the gum around it is usually red with congestion. If it is out of use long it will start to come up out of its socket and sticks up higher than its neighbours, as if trying to find something upon which to bite. Having thus got out of its alignment, its correct contact with the tooth on either side of it in the arch is lost and additional trouble results through food wedging, as in the first instance.

COMMON FEATURES.—There are two features common to both pictures. One is that the cause (*i.e.*, the loss of a tooth or part) in each of them is usually dental caries, which, as Dr. Sim Wallace has shown, is due to lack of cleansing food; the other is that the effect is that the patient is probably made so uncomfortable on that side of his mouth that he leaves off biting on it altogether.

A THIRD CASE.—This presents us with a third picture, in which all or most of the upper and lower teeth on one side are thrown out of use. Each tooth on that side then partakes, to a greater or less extent, of the nature of those teeth

described in the first two cases. They are coated with food, their surrounding gums are inflamed, they form tartar, their root membranes are infected, and as months or years go by an extensive pyorrhœa is brought about. The primary cause of all this is improper food.

STARCHY FOOD THE ENEMY.—It is, however, a fact that people contract pyorrhœa who have never had a decayed tooth in their lives and who have well shaped dental arches, with good contact points between the teeth all round. They stand a better chance of escaping it than most of us, since all their teeth are sufficiently comfortable to bite on, and therefore get their share of use and are more likely to keep clean. Yet they may get it if their starchy food is sufficiently sticky.

CAREER OF A PIECE OF CAKE.—Eat a piece of cake and a quarter of an hour afterwards examine your mouth. You will see a line of food all along the gum margin and most of the interstices between the teeth absolutely blocked with food. Take a piece of blue litmus paper and put it into one of the interstices. It will turn pink immediately, showing that the gums are not only exposed to the impaction of food upon them, but to the acid products of fermentation. Take a toothbrush and brush the teeth in the usual happy-go-lucky way of most people and examine the gums and interstices again. Food will probably still be there. Chew a raw apple or a slice of tough meat thoroughly all round the mouth and the cake has gone. The apple and the meat will not stick, unless there are already defective contact points between the teeth.

THE MORAL.—The lesson is obvious. Our teeth and gums (especially the gums between the teeth) are arranged by Nature to cleanse themselves on fibrous food. The tongue and cheeks, so far from rubbing off the teeth the soft starch paste which so much of our food becomes when chewed, fail to get any hold of it, owing to its semi-liquid and slippery nature, especially as such foods do not encourage thorough mastication. On the contrary, the tongue and cheeks tend by their pressure to drive the food between the teeth and against and beneath the gums, as also does the mere act of biting. Can we wonder that this frequent presence of fermenting starch paste on and under the gum margin causes

inflammation, with pyorrhœa as a possible sequel? The wonder would be if it did not.

“THE MAN IN THE STREET’S” VIEWS.—We dentists have a little overdone the scientific aspect of pyorrhœa. Its bacteriology, the opsonic index of the patient’s blood, the vaccine treatment, the electrical treatment, all these are extremely interesting. Yet the man in the street expresses the fundamental truth when he says that no one has any business to get it, and that surely there must be some obvious reason—something we are doing which we should not be—which makes it so absurdly common. That is a safe assumption. We are given teeth obviously capable of masticating hard fibrous food, and which can be proved by experiment to keep clean simply by such use. We, however, do not more than occasionally allow them to perform their proper function, and therefore they and the gum margins do not keep clean. The resulting inflammation is Nature’s penalty for our infringement of the law that loss of function is followed by disease.

MASTICATION AS A SAFEGUARD.—Some people, I admit, will keep a fairly healthy mouth, and others on a similar diet will get an unhealthy one. The degree of resistance is not always the same, neither is the vigour which people put into their mastication. A vigorous chewer will always have a cleaner mouth, other things being equal, than a feeble one.

TOOTHBRUSH: AN INDICTMENT.—Some would perhaps add that the amount of toothbrushing done is an important factor. I cannot close without a reference to this subject, which has engaged my close attention for many years. My unalterable opinion is that, when practised in the usual side to side or up and down way, its *ultimate* effects are bad, even disastrous.

It seems absurd, but apparently necessary, to point out that the mouth is not part of the face or outer man, but part of the digestive tract. It is not lined with skin, but with mucous membrane. It would be just as much flying in the face of Nature to brush our stomachs as to brush our mouths. We should do that if we could, and then invent

a new name, for the particular disease of the stomach lining from which we should all be suffering.

ITS ULTIMATE EFFECTS.—Toothbrushing, I allow, does remove at once a certain amount of food from between the teeth and crevices on the masticating surface. So far, so good. As time, however, goes on it removes the substance of the teeth themselves and that most precious tag of gum designed to protect the interstice and the top of the root membrane. It would require a separate paper to deal with the destruction of the tooth enamel and underlying dentine. I have however, seen no one who has practised tooth brushing, vigorously daily for twenty years, or even ten, whose teeth have not lost some part of their structure thereby, while I have seen by middle life teeth cut right through at the neck by tooth brushing so that they snapped off. It is of the gum margin, however, I wish to speak. Small wonder that it suffers under such constant and unnatural friction. In brushing from side to side and up and down, it is impossible to avoid continually striking it with the bristles, inflaming it, and wearing it away. What makes matters worse is the use of powder or paste containing insoluble particles or strong irritating ingredients. These are continually being brushed between the teeth and under the gum margin, causing a chronic inflammation and the formation of hard, dark tartar which, in its turn, causes inflammation and absorption of the root membrane and all the steps leading up to loosening of the teeth and pyorrhœa.

A LESSER EVIL.—If, owing to unsuitable diet or smoking, the teeth seem to need cleansing by brushing, let it be done entirely from the gum to the tooth (down with the uppers and up with the lowers) and let the mouth be well opened and the lip held away, by which means the free edge of the gum will not be struck nearly so much, nor will particles tend to be driven underneath it. If cleaning preparations be used let them be of a soluble nature, such as salt or soap, which if brushed between the teeth and under the gum will dissolve out again in the saliva. If the teeth are still stained use something distinctly gritty occasionally rather than an ordinary powder or paste daily. In either case the surface

of the teeth is bound to be destroyed, but the gums need not be to the same extent.

NATURE'S WAY.—Hard rinsing with plain water will not remove stains, but gets rid of food from the parts that matter almost always as well as brushing and without damage. No way, however, equals Nature's way of chewing detergent food, and it is unlikely that anything short of, at any rate, a partial return to this and the consequent elimination of the toothbrush, will check the incidence of dental caries and pyorrhœa.

CONTRIBUTORY CAUSES.—There are, I am aware, many other causes contributing to the prevalence of pyorrhœa. Some, such as fevers, chills, various forms of septic poisoning, may be regarded as exciting causes only, which would not suffice to bring about pyorrhœa, if the mouth were previously in a perfectly normal and healthy condition. Even irregularity, or crowding of the teeth, unless in a degree amounting to gross deformation, need not, though as matters are it frequently does, result in pyorrhœa at a comparatively early age. Other possible contributory causes, such as the wearing of artificial dentures, imperfectly made crowns, bridges, or fillings would, of course, not exist if the mouth had not already suffered from the effects of a too refined, starchy, and sugary diet causing dental caries.

THE ONLY REMEDY.—Nothing short of a radical change to a more natural diet is likely to improve matters, and it seems well nigh hopeless to look for this, at any rate in our lifetime. Still, by ventilating the subject and by a studious avoidance of scientific terms, which to the layman only obscure the issue, even a short and necessarily crude paper like this may do something, however little, towards making for national health and efficiency.

THE CHAIRMAN : You have shown by your applause that you think Mr. Holborn has made an admirable selection of points from a difficult subject. Our time for this subject is short. After the discussion is concluded, there will be the postponed discussion upon the three papers of yesterday morning.

A PREVENTABLE DISEASE.—Dr. SIM WALLACE: Mr. Holborn has given us a common-sense presentment of this disease of pyorrhœa and I heartily agree with him. I have never heard a paper put so clearly as to bring before the public the fact that they are dealing with practically a preventable disease.

SALIVARY CORPUSCLES AS SCAVENGERS.—We have been told by some of our physiologists and by books that have come into current use, that the salivary corpuscles probably come from the tonsils. They do not come from there at all. The gum comes up to and overlaps the tooth, and it is into the space or sulcus thus formed that the salivary corpuscles are discharged. This [drawing a sketch on the blackboard] is supposed to be the crown of the teeth with enamel covering. It ends about the neck of the tooth and the gum margin comes to about the same place. There is a little crevice or slit between the edge of the gum and the neck of the tooth. That place, obviously, is particularly vulnerable, on account of the impossibility of it being cleaned, if there is no special provision of Nature. But Nature is not such a fool. It does make provision for having it kept clean. According to Professor Black, the salivary corpuscles pass out into the sulcus between the neck of the tooth and the gum. The function of these corpuscles is to eat up the bacteria that get in. Consequently it is kept perfectly clean without other antiseptics. Increased exudation of salivary corpuscles is brought about by mastication.

HOW PYORRHŒA STARTS.—When we do not use a tooth, we find that it does not respond in the same way in the matter of stimulation, salivary corpuscles and cleaning. Soon infection of the gum margin is set up, the food is packed with bacteria, and, as Mr. Holborn has said, the initial stage of pyorrhœa has arrived.

MASTICATION—ITS ESSENCE AND EFFECT.—Dr. HARRY CAMPBELL: I am much interested in the remarks of Dr. Sim Wallace. I have long held that the essential cause of pyorrhœa is the non-use of the teeth, because we have to remember that in mastication the teeth are pressed down in their sockets and made to move about in them. Mastication consists in the firm pressure of the lower jaw against the upper, plus a lateral movement: it is a true grinding action. This

stimulates the circulation of blood in the whole of the periodontal membrane. Proper mastication prolongs the life of the teeth. You ought to "dance" your teeth, so to speak, in their sockets for a couple of hours in every 24. (Laughter.)

A PEASANT'S CONFESSION.—As to the toothbrush, we doctors and dentists have all known people who never resort to the toothbrush and who yet have sound teeth. I remember meeting a peasant, 58 years of age, from whom I elicited these interesting facts, that he had never been to school, never been to church, and never used a toothbrush¹ (laughter). Yet he had 32 sound teeth in his head and, by the way, he was brought up on barley bread.

TOOTHBRUSH VERSUS TOOTHPICK.—We are all familiar with the erosion which takes place in the upper teeth, most frequently at the junction of the gum on the left side, because the toothbrush is plied there by the right hand. The toothpick is not an elegant appliance, but I suppose that Mr. Holborn would prefer it to a toothbrush, from the point of view of the health of the teeth.

WHERE PYORRHŒA OF THE BACK TEETH BEGINS.—Am I right in saying that, as regards back teeth, pyorrhœa begins more frequently on the lingual than on the buccal side? People of the educated classes after 30 have considerable recession of the gums on the lingual side of the molars.

ITS UNIVERSALITY AMONG WAGE-EARNERS.—Practically all poor patients I see have pyorrhœa after their twentieth year. The state of their teeth is too horrible for words. It is a national disgrace. Even as early as the late teens, recession from the lower incisors may be discerned. I believe that they are often the first teeth to drop out in pyorrhœa.

DIABETES.—Why is it that the teeth are so apt to drop out in diabetes? Has it anything to do with the sugary condition of the blood?

DENTAL SILK.—**DR. C. W. SALEEBY:** Is dental silk to be recommended and ought I to continue its use?

¹ The daughter of a farm bailiff, aged 18, was found on arrival in London to have a perfect set of teeth, though she had never possessed a toothbrush. This statement at the Nursing Exhibition, May, 1921, was capped by a bystander with one of her father, who died at 69 without having lost a tooth or used a toothbrush. He relied on rinsing and rubbing the teeth with a rag wrapped round his finger.—Ed.

AN INCORRIGIBLE OPTIMIST.—Dr. WHEATLEY, County and School Medical Officer, Shropshire County Council: I should like to join with the other speakers in praising Mr. Holborn's paper. It is one of the best that we have heard; and if it were not for the rather disappointing note upon which it finished, I should feel inclined to agree with it in every particular. I cannot, however, think that it is impossible to reduce enormously the bad habits of the people of this country. (Hear, hear.)

HOW SHROPSHIRE SHOWS THE WAY.—As a result of teaching in my county, principally through health visitors, a considerable proportion of the children, after weaning, are brought up on a diet requiring mastication. Good habits are thus formed and the problem of the education of the adult of the next generation should be comparatively easy.

WHAT THE GOVERNMENT MIGHT DO.—In addition to education, it is possible for the Government to do something. They have, during war time, altered the character of our bread. Why should not they, if convinced that refined wheatmeal flour is bad for the people, say that it should cease? (Hear, hear.) During the war we had bread made from flour containing 80 per cent. of the grain. Why, if this is such a superior food, should we go back to the 68 per cent. bread? The prohibition of the manufacture of bread which is not suitable as a main article of diet ought to have the careful consideration of the Government.

WASTE OF BREAD AND CRUSTS.—Again, it was an offence during the war to waste bread, and there is no good reason why it should not be one now. Unfortunately, it is generally the crust—in many ways the most valuable part of the bread—that is thrown away.

EDUCATIONAL WORK—PRESENT-DAY ADVANTAGES.—The principal work must, however, be done through education. The position is by no means hopeless; in fact, it is full of hope. We have machinery that we have never had before. We have our school medical, dental and nursing services, but above all we have an ever increasing army of health visitors, entering every house in which there has been a birth, trying to teach the mother how to feed her children and keeping the

children under supervision and advice until school age. With a sufficient number of intelligent, properly trained and properly directed health visitors, the education and influencing of the people in the right direction can be accomplished.

MOUTH BREATHING AND PYORRHŒA.—Mr. A. T. PITTS, L.D.S., British Dental Association: I have listened to Mr. Holborn with a great deal of interest; he strikes a sound, common-sense note to us as dentists. May I draw attention to what I believe to be an important predisposing cause of pyorrhœa, which is found in the mouths of mouth-breathers and those suffering from adenoids and enlarged tonsils? Here I will make use of Dr. Sim Wallace's diagram. He has pointed out that, at the neck of the tooth, we have the gum instead of ending as a flush joint, projecting upwards to form a free edge or collar round the neck and that between the tooth and the gum there is a ditch or trough. This ditch is normally kept free from infection by certain cells called salivary corpuscles. When a tooth commences to erupt and becomes visible through the gum, this trough exists in an exaggerated form, for a probe can be passed down between the tooth and the gum as far as the neck without opposition. As eruption goes on the ditch becomes less *pari passu* with the passage of the tooth through the gum, until, when eruption is complete, the free edge of gum is only a fraction of an inch in depth.

PROCESS OF ERUPTION.—Eruption is a complicated process and we are far from understanding how it is brought about. I believe that the last stages are due to a process of denudation of the tooth, much in the same way as the soil is washed from a rock by rain, and that this denudation depends on the functional activity of the jaws. Where this activity is lessened, as in mouth breathing, the final stage of eruption does not take place and the free edge of gum remains abnormally high and the ditch inside is deeper than usual. This condition must predispose to pyorrhœa. We know clinically that, in a large number of cases, pyorrhœa comes on in the front of the mouth (where this imperfect eruption is seen owing to mouth-breathing), and it is legitimate to connect the two. The same condition operates at the back of the mouth. We get an abnormally deep ditch at the back of the

lower wisdom teeth, but there the cause is apparently a reduction in the length of the jaw, which has been going on for countless ages. As a result, when the lower wisdom tooth comes through, it remains imperfectly erupted through lack of room. Here, again, we find this a common site for pyorrhœa and other infections of the gum.

WHAT THE BREAD AND FOOD REFORM LEAGUE DEMANDS.—Miss MAY YATES, Hon. Secretary, Bread and Food Reform League: I should like to emphasise what Dr. Wheatley said about the importance of bringing pressure to bear upon the Government. The Bread and Food Reform League has presented a Memorial to the Ministry of Health, signed by about 125 members of Parliament and members of medical and scientific societies, urging the Government to consider the advisability of introducing measures to protect meal flour and bread from deterioration and adulteration.

CASE FOR WHOLE MEAL.—The Government has raised the extraction to 80 per cent., but we insist on this 80 per cent. retaining the germ, as a most valuable constituent of the grain. The germ contains the vitamins and a large amount of the fat soluble A vitamin, whilst white flour has not one atom. All sorts of absurd objections are being raised. The chief one is that the germ could not be ground and was indigestible (laughter). The Local Government Report of Dr. Hammill¹ shows that the stone grinding mills will grind the germ easily and that in the roller mills, if precautions are taken, there is not the slightest difficulty. Wheat meal, finely ground, has been used for about forty years in Government institutions with the greatest benefit. The Report of the Food (War) Committee of the Royal Society² shows that 90 per cent. of the wheat was ground by an ordinary roller milling plant. The principal millers in the country also tell me that they can grind the germ.

IN DEFENCE OF THE TOOTHBRUSH.—Mr. WILLIAM BATES, L.D.S., School Dentist, Macclesfield Education Committee:

¹ A summary of its conclusions is given in *Facts for Patriots*, 2nd series.—Ed.

² Food (War) Committee of the Royal Society. Report on *The Food Requirements of Man*, March 1919.—Ed.

As a practitioner for 40 years and a school dentist, I should not like it to go forth from this conference that the toothbrush is an injurious implement and should be altogether abolished. I cannot agree, at any rate until the Government supplies our people, and particularly our working folk, with suitable food. A moderate and reasonable use of the toothbrush is an excellent thing.¹ (Hear, hear.)

LOSS OF FUNCTION AND DISEASE.—Mr. JAMES MCGHEE, St. Helens: Is there really any ground for the assumption that appears to underlie the various papers, except that of Mrs. Mellanby, that loss of function necessarily results in disease? I suggest that is not the case. We had hosts of instances during the war where people lost their sight, hearing, speech and other faculties and, after a certain rest, they have been restored. I am speaking as a layman and cannot be asked to take a deep technical view of the matter. The legs, undoubtedly, are more exercised than the arms, but the former are far more subject to disease than the latter.

IRELAND—AN AMAZING ASSERTION.—Some years ago at a Public Health Conference at Leeds, one of the surgeons said that it was recognised both by himself and his colleagues that persons coming from Ireland had remarkably fine teeth, and apparently that the poorer they were, the better were their teeth. The late Sir Charles Cameron, Medical Officer of Health for Dublin, said, "Yes, my countrymen have very fine teeth, and that is because they eat soft food" (laughter).

"THE MOST DELICIOUS BREAD IN ENGLAND."—Mr. T. C. HORSFALL, Manchester: I was told by an old man that the most delicious bread in England, or in any part of the world, was that made in the Ripon district of Yorkshire, one-third of rye flour and two-thirds of wheat flour.² The people were a fine set and looked particularly well nourished.

¹ Mr. Bates followed up his protest by sending the following telegram to the Chairman on the last morning: "Majority of dentists at yesterday's morning conference not in favour of abolishing reasonable use of toothbrush. Kindly take vote and ask how many of those present have used a brush to-day."—Ed.

² In the writer's childhood, "York Bread" was sold in Manchester, black in colour, made apparently wholly of rye and delicious in a sandwich of white bread.—Ed.

SUGAR—A HINT TO THE CHANCELLOR.—The *Times* of the last two days has contained a large advertisement informing us that the great want of civilisation is more sugar. Let us try to counteract that heresy by suggesting to the Government, which is in dire need of money, that they might usefully, in the interests of the whole community, tax sugar heavily.

A SUMMING UP.—The CHAIRMAN : We have had, you will all agree, an admirable paper and an excellent discussion. The latter has presented complementary and, apparently, conflicting data, all however, bearing upon the phenomena to be observed in this disease of pyorrhœa. We cannot, at present, find a synthesis which will embrace them all. That is for the future.

Mr. HOLBORN, in reply : I liked Dr. Sim Wallace's illustration very much. I had not time to deal with everything. I was told to keep my paper down to two thousand words ; but, as a matter of fact, it was 2,800.

IRON AND THE GUM MARGIN.—We are taught in textbooks that in lead poisoning a blue line is seen at the gum margin. Lead is not the only metal which is apparently deposited there. I am convinced that iron is likewise, because I have noticed it in people taking iron tonics in pill form, where the iron cannot come directly in contact with the mouth.

DENTAL GYMNASTICS.—With Dr. Campbell's remarks regarding the gymnastics of the teeth I was considerably in accord. Of course, with the incisors one gets comparatively little of grinding, or up-and-down movement.

AN ALTERNATIVE TO THE TOOTHBRUSH.—As to the toothbrush, it is largely used for the sake of making the teeth look clean.

Mr. BATES, Macclesfield : No, no, sir.

Mr. HOLBORN : I do not say solely, I say largely. Some people go carefully over their teeth with a little bit of wood. I believe certain South African natives do that, and they appear to have good teeth. We should have better teeth if we went over the surface with something like this, than by brushing them promiscuously.

WHERE PYORRHŒA USUALLY STARTS.—It is usually *between* the teeth that pyorrhœa starts, owing to the inter-dental papilla being lost through some cause or another.

DIABETES.—I am not competent to speak of diabetes, not being a medical man. The fact of the patients having a lessened resistance would seem to be an important element.

DENTAL SILK.—Dr. SALEEBY asked if I would use the dental silk. On the whole I think not. One tends to destroy the interdental capilla by dragging the silk down, unless you keep it very close against the neck of the tooth.

THE OUTLOOK.—I am glad Dr. Wheatley is more optimistic in regard to the possibility of Government action than I am. I did not say that the position was hopeless, but that I did not expect to see anything like a complete change of the nation's diet in my lifetime. I may see a partial one. If I saw a complete change on the lines which some of us are in favour of, I should expect to see a complete cessation of pyorrhœa and dental caries.

DENUATION ?—Mr. PITTS spoke of the last stage of eruption being denudation. I do not quite like the term. I cannot imagine that a perfectly natural function like mastication can actually denude the gum. Still, that may be only a matter of terminology. I fear denudation more through the action of the toothbrush in removing the gum.

"GOING FOR" THE TOOTHBRUSH.—Mr. Bates is sorry to find me "going for" the toothbrush. Yet statistics concerning its use and the amount of dental caries do not show that a person who brushes his teeth regularly is freer than one who never brushes them at all. It was found in school clinics that toothbrush drill did not prevent caries.

UP-TO-DATE DRILL.—If children are to be taught to use the toothbrush, they must be taught the right way, viz., not to brush from side to side, but to brush the lower teeth up and the upper teeth down. I admitted that the toothbrush would remove a certain amount of food and that only its ultimate effects were bad.

PRECEPT AND PRACTICE.—I am quite prepared to allow that you get a certain amount of food and stain off the teeth, but, on the whole, a child is better without a toothbrush. They cannot be trusted to brush their own teeth until they are fifteen years of age. My own children never use a toothbrush.

I would not dream of allowing them. They are not half careful enough.

POWDER AND PASTE.—There are many preparations of tooth-powder and paste on the market. We have not the faintest idea of the composition of most of them. It is not ethical to suggest that such should be used by our patients.

THE POSTPONED DISCUSSION.—The **CHAIRMAN**: We have now to commence the postponed discussion on the three papers read yesterday morning upon "The Extent and Consequences of Dental Disease," by Dr. Harry Campbell; "The Causes and Prevention of Dental Caries," by Dr. Sim Wallace; and "Sweets and Dental Caries," by Dr. James Wheatley.

A LESS FORTUNATE COUNTY.—Dr. **ARTHUR G. WILKINS**, Senior Medical Inspector, Staffordshire County Council: I was tremendously interested in Dr. Wheatley's paper yesterday, because I am in a neighbouring county and I am sorry to say that the state of things he speaks of does not exist there. Dr. Wheatley pointed out the great improvement in children of five years of age, born when sugar was scarce and sweets non-existent. If he went into our county he would find that we have not got anything like the results obtained in Shropshire. The explanation is that Dr. Wheatley has been carrying on an energetic campaign of education through the health visitors. Unfortunately, our School Medical Service has been completely destroyed during the war and it is my painful duty to make a fresh start. It is, however, encouraging for us even to have Dr. Wheatley's figures to consider and to point out that they are perhaps not anything like ours. Yet the difference between his pre-war figures and post-war figures is so striking that there must really be a great improvement. That I put down chiefly to education. Therefore I am somewhat optimistic, because what has been done in Shropshire we may do.

CARIES—LOCAL OR CONSTITUTIONAL?—Mr. **W. H. JONES**, Dental Officer, Staffordshire, late Borough Dentist, Cambridge: I had not the advantage of hearing the papers yesterday, and have only read the abstracts. Probably no

one in this room has any criticism to offer with regard to the observations and recommendations of Dr. Sim Wallace and the other speakers. There are, however, decided differences in their application. For a considerable number of years investigations have been going on into this question of dental caries. I hold strongly the view that it is constitutional, and not merely local. A great deal too much attention has been paid to the diseases that are supposed to follow dental caries. I am one of those who believe that the majority of those diseases actually precede dental caries, and that it is only the outward and visible sign of the constitutional lesions that have preceded it. Particularly is this the case with tuberculosis.

MALNUTRITION AND CARIES.—In a paper in 1911 I discussed the question of malnutrition and suggested that the effects of dental caries were in some way allied with general constitutional disorder connected by me with tuberculosis. Since then the researches of Professor Gowland Hopkins, Sir William Osler, and, if I may say so in the face of the lady, particularly of Mrs. Mellanby, have largely substantiated these observations and indicate that, in the question of dental caries, we are face to face with what is known as a deficiency disease.

A DISSENTIENT.—When I say that, I do not doubt that loss of function by improper diet will have an extremely bad effect upon the teeth already formed. In pursuance of my theories we in Cambridge have endeavoured to treat the expectant mother and the nursing mother. That is what I want to say lest members of this Conference, and particularly lay members, should go away with the impression that there is a consensus of opinion that dental caries is simply due to the sticky nature of food and to this adhering in particles to the teeth.

WHY A MOTHER'S DIET IS ALL-IMPORTANT.—**Dr. C. W. SALEEBY**, London: Perhaps I may be allowed to supplement the remarks of the previous speaker? The question of the relation of the diet of the mother and the nursing mother to dental caries and to many other things has intense interest for me. One question raised is eugenical. Is it only the

modern mother who suffers from grave and acute dental caries when she is carrying on the normal function of gestation? The work of Dr. Mellanby and of Mrs. Mellanby has suggested to me that, perhaps, it may be a question somehow of the demands made upon the vitamins in the mother's body by the embryo and the foetus. If we could reasonably better the diet of the mother and realise that our duty was to supply her, not *only* with vitamins for herself but to pass on to her child—we believe the body does not make those things, they must be supplied to it—then we may be able to relieve her from having to pass on to her child vitamins which she could not spare.

CAN DEFICIENCY OF VITAMINES PRODUCE CARIES?—That raises another question. How and why, if at all, the deficiency of vitamins can produce dental caries? Mrs. Mellanby shows us, in the jaws of those animals, what she has just demonstrated to me to my entire satisfaction, how the deficiency of vitamins affects the *production* of enamel. Is vitamin deficiency going to affect the protection of enamel already in existence? Is there a vitamin factor in the bacteriology of the mouth? Has it relation to immunity against the micro-organisms of dental caries? We know from Dr. and Mrs. Mellanby that deficiency in vitamins allows certain organisms to prey upon the eye of the growing creature, producing xerophthalmia. Is it not possible that dental caries may, similarly, be due to the withdrawal of some protection which vitamins furnish? Perhaps Mrs. Mellanby will tell us of some evidence suggesting that defective feeding of the expectant mother affects the quality of the first teeth of her child?

STILLBIRTH—A STANDING REPROACH.—There is the further question whether defective feeding may not have something to do with stillbirth? It is a standing reproach to obstetrics that when the most careful inquiry is made into the causes of stillbirth, including syphilis, from 25 to 33 per cent. of all such births remain utterly unexplained. Is it possible that this vitamin deficiency in the food of the expectant mother accounts for part of the hitherto unexplained? If we could find in the diet of the expectant mother the key, both to her dental caries, to the condition of the teeth of

the child, and to the factors that determine whether her child may be born alive, it would be an epoch-making discovery in national eugenics. I hope some of the work discussed here may lead us to it.

“IGNORANT DOGMATISM.”—A distinguished teacher of physiology said at a conference of this description that it did not matter twopence what you fed the expectant mother on, “it did not make the slightest difference to her child.” I hope we are getting past that suggestion of ignorant dogmatism. (Applause.)

WHOLEMEAL BREAD.—Miss MAY YATES (Hon. Secretary, Bread and Food Reform League): I can confirm what Dr. Wheatley said about the improvement in children fed for the last few years on more natural food. An eminent botanist wrote to me saying that his brother’s children, who had used wholemeal all their lives, had much better teeth than those who commenced using it when they were 12 to 13 years of age. No doubt their parents had also been using it. That is a little practical illustration.

The CHAIRMAN: I think you would like to hear Mrs. Mellanby.

A DISTINGUISHED LAYMAN’S THANKS.—Mr. T. C. HORSFALL, Manchester: Before Mrs. Mellanby speaks may I, on behalf of the laymen of Manchester, express our profound gratitude to the readers of papers yesterday for the valuable and stimulating information that they gave us. I am an old member of the Manchester and Salford Sanitary Association, the oldest Society I believe of its kind in the kingdom, and I think that it, the Eugenics Society, and others will feel that the admirable papers lay an almost painful duty upon us of bestirring ourselves to put this information into practice.

A DAMNING FACT.—A very important fact was mentioned by Dr. Harry Campbell, who told us that he has met a considerable number of Poles who came to England possessing perfect teeth, but that under the influence of our sloppy English diet, the use of which involves no mastication, the teeth of these people have rapidly deteriorated. That seems to be convincing evidence of there being something radically wrong in the feeding habits of our people.

FOOD FOR THOUGHT AND ACTION.—It is obviously the duty of all members of such societies as our Sanitary Association to set to work to study the subject in the most careful way, and I hope, with further guidance like that of the lecturers yesterday, to see whether we must not agitate for some great improvement in the feeding of our people. We cannot be too grateful to those who addressed us yesterday for the important facts they brought before us. (Applause.)

WHAT SHROPSHIRE SAYS TO-DAY.—We have also the invaluable experience of the Medical Officer of Health for Shropshire, who told us that in the comparatively short time in which he had held office he has been able to show, under the influence of a reduced supply of sugar and improvement in the dietetic quality of the bread, a striking diminution in the amount of caries in the children of his district. All these facts give us enough to think about earnestly for a long time to come.

THE VITAMINES STORY.—Mrs. MELLANBY : Unfortunately I was not able to be present during the greater part of Thursday morning. I happened, however, to enter the Conference when Dr. Sim Wallace was saying that the audience would hear in the afternoon something about a vitamine, but that they were to take no notice of it. (Laughter.)

A THEORY RESTATED.—Vitamine is one important factor in the normal development of jaws and teeth. It will also, I believe, be shown to play a part in the resistance of the body to caries, although direct evidence of this is still lacking. It may aid resistance in various ways, apart from the better formed and more regularly arranged teeth which it helps to produce. It may, for instance, alter the saliva and so assist in antagonising the development of bacteria in the mouth. It certainly increases the resistance of the animal to infective conditions in general. A great deal more work, not only in experiments on animals, but in connection with the feeding of children and of expectant and lactating mothers must, and will, I hope, be done.

PART PLAYED BY THE TEETH.—Dr. Saleeby's remarks were very interesting. The probability of the resistance of the teeth themselves to dental caries and other diseases must be considered, in spite of the fact that some authorities deny this possibility.

INCOMPLETE EXPERIMENTS.—My husband and I started some work a year or two ago with regard to the effect of vitamine on pregnant bitches, but this research is not far enough advanced to bring forward.

SWEETS AND DENTAL CARIES.—Mr. JAMES MCGHEE, St. Helens : Might I ask if any experimentalists have found that sweets of which glucose is the basis are more dangerous than sugar ?¹ We know that when acids are given medicinally they inflict serious injury upon the teeth. Hence, it is possible that glucose, of which sulphuric acid is a constituent in the process of manufacture, may be an important factor in bringing about dental caries.

HOUSING AND DENTAL DISEASE.—Mr. T. P. WOLSTON WATT, L.D.S., Senior Works Dentist, Messrs. Cadburys, Bournville : One subject has not been touched upon, and that is housing. Possibly many people may not consider there is much relationship between housing and dental diseases. I come, however, from Bournville, where a large housing experiment has been tried. We have a garden village, which is well worth a visit. We were convinced that housing conditions would affect all matters connected with health, and we certainly do notice that the teeth of the children are a bit better than in some of the surrounding places, where housing conditions are bad. In all fairness I must add that we could not definitely argue that any improvement noticed was entirely due to the housing.

MORE ABOUT THE TOOTHBRUSH.—About fifteen years ago our firm started a dental clinic in the factory. Incidentally, with it was inaugurated a system of supplying four of the schools from which we drew most of our young employees with toothbrushes and powder free. (Laughter.) We find that at these schools, at the age of 14 or 15, when the children come to our employ, those from schools where the teachers have taken an intelligent interest in the subject of dental cleanliness, and the pupils have conscientiously used their brushes, on the whole have cleaner teeth and less caries than

¹ An interesting letter from a dentist on the dangers from low-grade sugars, and urging a Government enquiry, appeared in *National Health*, April, 1921.—Ed.

those from schools where no toothbrushes were used and where the children's mouths were in a very dirty condition.

I am not going to claim the credit entirely for the toothbrush, because we frequently get young people from the surrounding country districts. When I examine a boy with particularly good teeth, I can often guess that he comes from a certain village where all the young people seem to have good teeth. There are many orchards round that village!

SWEETS.—The question of sweets has been raised. Dr. Sim Wallace singled out chocolates above all things. We can, of course, see the chocolate in the mouth by its colour. On the other hand, many sweets sold, especially the cheaper varieties, contain, I believe, mineral acids. How far they, and not entirely the sugar, are responsible for the fermentation and decay is a question which would need a considerable amount of investigation.

IN DEFENCE OF CHOCOLATES.—I cannot conscientiously say that any individual suffers any particular detriment to the teeth through chocolates. The ladies all like chocolates. So do I. And, good or bad, we will continue to eat them. (Laughter.)

Chocolate is, in my opinion, not any worse and probably not nearly so harmful as certain other sweets. Dr. Sim Wallace pointed out that for a considerable time after chocolates had been eaten the remains are to be seen hanging about the teeth. It is a matter for careful investigation whether that debris has any sugar in it at all. I hope I am not giving away any trade secret in saying that chocolates are made of ground cocoa, mixed with a certain amount of cocoa butter, and, of course, sugar.¹ Now, ground cocoa is slightly soluble in water. We all know that, because in our cup of cocoa we find the dregs. It is also a neutral body, neither acid nor alkaline. It can, therefore, have no effect on the teeth by itself. Secondly, cocoa butter is also a neutral body, and can, therefore, have no worse effect on the teeth than ordinary butter. Has Mrs. Mellanby ever analysed cocoa butter, and does it contain any vitamins,

¹ For full information regarding the food value and digestibility of chocolate and cocoa, see *Facts for Patriots*, 5th series, 4d.—Ed.

because, if so, it rather points to chocolate being good for one? (Laughter.)

WAR BREAD AS THE CHIEF FACTOR.—Unless there are many factors which Dr. Wheatley did not bring out, I can see no reason why the lack of sweets caused so much improvement. Their absence, although contributory, no doubt, is not so important as the fact that we all had to eat an abominable concoction called “war bread.” This, as Miss Yates has pointed out, often had a large amount of stuff left in that was detergent in its action. We were, moreover, not allowed to eat it new and the crusts were eaten. The improvement is largely due to that factor rather than to inability to obtain sweets.

EFFECT OF PROPAGANDA.—Again, a certain amount of propaganda work has been undertaken in Shropshire, and has produced a marked effect. If something can be done in the way of educating the public to prefer wholemeal bread to that made from fine flour, we should find a marked diminution in dental caries simply for that reason.

CARIES IN FLOUR MILLS.—In going over mills where flour was flying about I have noticed that caries was prevalent not in the crevices but on the actual front surface of the teeth, just where the gum joins the tooth. That condition exist in works where flour is largely used. You will not find the same cavities produced by sugar.

PORRIDGE IN THE OLDEN DAYS.—The mere fact of this fine flour causing decay is possibly the reason why Dr. Sim Wallace condemns porridge. In the olden days in the Highlands they usually ground the oats themselves in stone mills, so that it contained the whole grain of the oat. In that case oatmeal would not be the imperfect food that it often is to-day. I remember speaking to a man from the Hebrides who had splendid teeth. There, he told me, they make the porridge properly. It is solid and requires chewing. It is not the sloppy, pappy mess usually served up in England as “Scotch porridge.”¹ When we condemn porridge we must,

¹ For the food value, digestibility and best ways of using oatmeal, see *Facts for Patriots*, 1st series, 4d. The 4th series—4d.—contains information and recipes for barley and rye.—Ed.

in all fairness, say it is because the oatmeal is neither properly milled nor cooked.

CONFESSION IS GOOD FOR THE SOUL.—I have six youngsters, and every night they go to bed with a chocolate. The three eldest children were born before I went to Bournville, and did not have so much chocolate. They had other sweets and had a certain amount of caries in their temporary teeth. Nowhere can I get a probe into the teeth of those born at Bournville. The eldest are 8, and the youngest is 6. She is a war-time baby, and has got a lovely set of teeth. Two of my youngsters are fond of crusts and, strange to say, they have the worst-formed jaws.

METHODS OF FEEDING.—Mr. WILLIAM BATES, L.D.S., School Dentist, Macclesfield Education Committee: Were they breast fed or bottle fed?

Mr. WATT: For a certain time they were all breast fed. Two sets of them were twins, so that it was not possible to feed them thus all the time. They all had a dummy, and the one that had it most has the best formed jaws. (Laughter.)

Mr. T. C. HORSFALL: May we be told how to make Highland porridge?

A POSSIBLE VIA MEDIA.—Mr. ROBERT LINDSAY, Dental Secretary, British Dental Association: Dentists are so much in evidence that I felt that probably it would be far more interesting if they were the listeners, and if other members of the Conference did most of the speaking. In addition, we are all in favour of food reform, and none of us wishes to say anything which would detract from the value of what has been suggested, even although we may not entirely endorse the position which has been taken up, for example, by my friend Dr. Sim Wallace or by Dr. Harry Campbell. My only suggestion is that we should not press too far the argument that dental decay cannot be produced by other means than those put forward in Dr. Sim Wallace's paper. If he absolutely refuses to admit that there may be some grave constitutional and predisposing causes, then he will not believe that it is necessary to do anything for the teeth of expectant mothers with a view to the teeth of their offspring

being favourably affected. I should like to ask Dr. Sim Wallace if that is his attitude, since it involves serious opposition to what was said yesterday and in the discussion generally. With regard to the great degeneration in the teeth of the Poles who came to this country, perhaps Dr. Campbell will say if he does not think that the serious constitutional change which took place in these people's lives in moving from Poland or Russia may have been a large factor in producing the condition in which he found them. That would point to what Mr. Jones has drawn attention to—viz., the possibility of dental decay being influenced by previous constitutional conditions.

PLEA FOR THE OPEN DOOR.—Dr. Sim Wallace told us that he based his contention upon the findings of Black and Sir Charles Tomes and certain other investigators. I would, however, point out, what he will acknowledge at once, that Dr. Black only said that his microscopical investigations did not reveal to him any difference between hard enamel and imperfect enamel. He did not go the length of saying that there could be no such difference. I hope, therefore, that, while Mrs. Mellanby will not take Dr. Campbell's and Dr. Sim Wallace's line and pay absolutely no attention to those carbohydrates, she will continue her investigations as to the effects of diet upon the development of enamel in the embryo. In doing so, she will be in line with all the more advanced thought in dental work. There has been a rally from the early Victorian position that everyone had an absolutely dead and inorganic structure, which could not be affected by constitutional change. To-day, while no one makes dogmatic statements as to the extent to which constitutional conditions can influence the state of the teeth, we have an open mind on that subject.

GENERAL HEALTH AS A FACTOR.—As to the absence of sugar and the effect on the children's teeth, perhaps Dr. Wheatley will tell us if the general health of the children was not exceedingly good during that time and might not that have reflected on their dental condition?

I hope that nothing I have said will be taken as suggesting any lack of interest or appreciation of the papers. Undoubtedly we have discovered causes of dental caries, but they have not told the whole story.

NURSING AND EXPECTANT MOTHERS.—**DR. HARRY CAMPBELL :** We are taught that the teeth of the expectant and nursing mother are particularly apt to decay. I am not aware, though perhaps Dr. Sim Wallace and Dr. Wheatley can tell us, whether we have any definite statistics on this point.

MORAL FOR THE PUBLIC.—As regards the work of Mrs. Mellanby, all of us agree that vitamins are essential and that it is necessary to give the proper kind of food. Dr. Sim Wallace has said that the essential cause of caries does not lie in the teeth, it lies in the environment of the teeth. Whatever view we take of the Mellanby position, this must not prevent us from recognising the value of what Dr. Sim Wallace has called oral hygiene. We must teach the public to keep the mouth in a clean and healthy state. Let us push that point well home.

HOUSING AND THE TEETH.—**MR. WATT** has brought forward a number of most interesting matters. The better housing is, the healthier are the inmates and consequently the better the teeth.

IN PRAISE OF APPLES.—As to apples. One of the few normal jaws that I have seen was that of a man who comes from Devonshire and is now living in London. He had an absolutely perfect jaw, such a one as you find in the primitive Australian. He is 58 years of age and has not a decayed tooth and has only lost one tooth. As a young man he “almost lived on apples,” which shows the value of this fruit.

VALUE OF CRUSTS.—My experience of crusts is not that of Mr. Watt, because over and over again I have found that whenever children were fond of crusts or chewed crisp bread, they had better jaws and teeth—and better arranged teeth—than others.

WHOLEMEAL IN THEORY AND PRACTICE.—**DR. SIM WALLACE :** I am interested in Miss Yates's remarks, and, from the point of view of diet, have no objection to whole wheat meal. From some standpoints it is desirable that we should have the germ of the wheat in the bread. Miss Yates, however, attaches considerable importance to wholemeal bread from the point of view of the teeth and she gives what she calls a good illustration of a family that did remarkably well on this

kind of bread. I remember being asked to open a discussion on bread at the Odontological Society some years ago. At that time, and for a considerable number of years before, there had been a craze for stone-milled flour. One of those present recorded a case of a family brought up wholly on the stone-milled bread (so far as bread was concerned). The children were remarkably healthy, except that their teeth were remarkably bad. So I would not advise you to pay too much attention to wholemeal bread for preventing dental caries, especially as, in another family referred to on the same occasion, white bread was the staple article of diet and the teeth of one of the children had been described by Dr. Harry Campbell as the best teeth in England, while the other was also absolutely free from caries.

MOUTH HYGIENE—HOW ATTAINABLE.—On one or two matters there is considerable unanimity of opinion. We do want hygienic mouths, but this cannot be brought about by antiseptics, toothpicks, or floss silk. There is also a general agreement that, by a physiologically correct diet, a hygienic state of the mouth can be secured. Not a single speaker has opposed the view that has been uppermost in many of our minds, that certain uncooked foods, taken at the end of meals, tend to leave the mouth clean. Yet some people say: "Oh, yes, we will wait and have this question thoroughly looked into and everything will be all right—in fifty years. We will then have a campaign on the prevention of decay of the teeth." Such a campaign is urgently wanted now. (Hear, hear.) Every year of delay means millions of decayed teeth.

DR. WHEATLEY'S STATISTICS.—There is no reason whatever why other counties should not show the same remarkable improvement as Shropshire. I would like to draw particular attention to Dr. Wheatley's figures and what they imply. To me, I admit, they are not remarkable. They are exactly what I expected. Long ago I got about a dozen people to practise what I preach and the teeth showed such a remarkable improvement that from birth to about seven years, there were no carious cases at all. So, when Dr. Wheatley brought out his statistics, I was not surprised. I thought it, however, marked an epoch, because he had corroborated in a convincing way and on a large scale the importance of the principles

that we had put into practice. Really there is nothing on the market, as it were, except propaganda work, such as Dr. Wheatley has been doing for the last ten years.

SUGARS.—One speaker wanted to know something about the fermentation of sugar. Dr. Miller made experiments on the amount of fermentation that took place with different kinds. He came to the conclusion that from this point of view, one was as bad as the other.

CHOCOLATES AND BISCUITS.—Mr. Watt mentioned that I took chocolate as an apt illustration, because it was visible in the teeth. As a matter of fact, I pointed out that biscuits and milk could be picked out in the same circumstances. You had, however, to look for it carefully, because the biscuit and milk were practically the same colour as the enamel of the teeth.

CHEAP AND DEAR SWEETS.—As to mineral acid and cheap sweets opposed to dear sweets, I do not know that cheap sweets are any worse than dear ones. It is the pure sugar which is the most dangerous ingredient in sweets.

BOYS WHO REFUSED CHOCOLATES.—I do know this with regard to certain types of dear sweets. Children with cleanly tastes do not often like them. I happen to know two children pretty well, and a gentleman who did not know them well bought them some expensive chocolates in Bond Street. These two boys were given the chocolate, but they would not eat it, because it stuck in their mouths so much. Children brought up with clean mouths resent having sticky stuff about their teeth.¹

DIET OF NURSING AND EXPECTANT MOTHERS.—Respecting expectant mothers and diet, I have indicated, in the case of the temporary teeth, that the teeth come through practically perfect in over 99 per cent. of cases. There are many ways, however, in which bad feeding of the mother may affect, indirectly, the teeth of the child. One is through the influence it may have on the milk, which may give rise to bottle feeding and to efforts to keep right the digestion of the child. Such children often get put on pappy food, so

¹ It is interesting to find that these boys also disliked toffee, apparently because of its stickiness.—Ed.

that they frequently have rather more irregular teeth than breast-fed children. It is, of course, important to feed the mother properly. Her food, moreover, should be of such a nature that the mouth and the alimentary canal are in a hygienic state.

MILK—A CRITICISM.—That involves certain reforms in diet. It means that instead of mothers having excessive doses of milk they should be given food which is suitable for their physiological requirements, and which (unlike milk) will leave the alimentary canal in a hygienic state. Normally, having 32 teeth, women are physiologically adapted for a very different form of diet than milk. The best producers of milk never get milk. Cows live, as a rule, on a physiologically correct diet—viz., grass. In the case of mothers, grass is not a correct diet, but neither is milk.

CREDIT WHERE CREDIT IS DUE.—Dr. JAMES WHEATLEY, County and School Medical Officer, Shropshire County Council: Dr. Sim Wallace has said that he was not astonished at the figures that I put before this meeting. I must say that I was greatly astonished, so much so that I hardly felt sufficient confidence to bring them forward. I still feel that they may be modified to some extent. There may be slight discrepancies due to the personal factors in the examiners, but these are immaterial. I do not attribute the improvement to any great extent to the influence of our teaching in Shropshire. If further investigation proves the figures to be substantially accurate they should prove a powerful incentive to reformation of our foods.

PART PLAYED BY SWEETS.—The gentleman from Bournville said that I laid too much stress on sweets. I simply enumerated the war changes—viz., 80 per cent. reduction in sugar, the alteration in bread, and a diminished supply of milk. I did not attempt to apportion the effect on the teeth of the various alterations in food.¹

¹ Dr. Evan J. H. Fraser, S.M.O., Hull, likewise attributes the improved condition to rationing and the consequent diminution of sugar and larger amount of offal in bread. If, he adds, as food returns to pre-war quantity and quality, children's teeth again deteriorate, serious attention should be given as to whether the extra milling of flour and the unlimited manufacture of sweets are not evils demanding legislative regulation. Annual Report for 1920.—Ed.

FRIDAY, MAY 14TH.

AFTERNOON SESSION.

TEMPORARY DENTITION.—CHAIRMAN, J. HILDITCH MATTHEWS, L.D.S., Dean, Manchester Dental Hospital: The subject we have to consider is that of temporary dentition. It is one of the first importance, and the proceedings of this Conference would not have been complete without these papers. We are fortunate in having with us Mr. Jones, of Cambridge, and Mr. Pitts, of London. Both have had many years of special experience in dealing with the teeth of young children.

IMPORTANCE OF DENTAL ATTENTION DURING
FIRST DENTITION.

By WILLIAM H. JONES, M.A., L.D.S.

*Dental Officer for Staffordshire, late Cambridge Borough
Dentist.*

COURSE OF THE CONFERENCE.—In the proceedings of the Conference thus far, we have had put before us a series of propositions of how to prevent this extremely prevalent, insidious, and dangerous disease of decay of the teeth. The papers now presented have not merely theoretical interest. They have an equal amount of practical interest, inasmuch as they do not deal with the problematical view, but with attempts made to cure and to restore to their proper function diseased teeth which, unfortunately, abound in 97 per cent. of the children of this nation.

CAMBRIDGE AS A PIONEER.—We started our work in Cambridge in the year 1907, and are the pioneer authority to endeavour to deal systematically with all the children in the area. We began with an inspection of every child under the Borough Education Authority. The conditions were found to be so appalling that they could only be remedied by the employment of sufficient dentists, whose cost would be utterly beyond the resources of the town.

PLEA FOR A LONG VIEW.—We were therefore forced to adopt some plan by which we might be able to take a long view, and I would urge in all dental problems the necessity of taking such a view. We made a commencement, endeavouring to prevent the recurrence of the conditions that the first inspection had revealed. That, in itself, was an indirect method of prevention. We therefore decided on the heroic step of jettisoning all the children above eight years of age under the Education Authority and resolved to try and build up a new race, commencing with children who had attained the ages of five to seven years, and, by the treatment of their temporary and permanent teeth, to restore functional activity in the hope that evils would not ensue to the same extent in the older children.

TOOTHBRUSH AS "A NECESSARY EVIL."—Then we resorted to the use of toothbrush clinics as a useful method of propaganda. I am inclined, however, to agree with some of the speakers that the toothbrush is possibly not everything that is claimed for it; but under existing conditions it is at least a necessary evil.

WHY PLANS HAD TO BE MODIFIED.—We then endeavoured to deal with the temporary dentition, not only by the extraction of all septic and overcrowded teeth and roots, but also by filling. After a little while we found it necessary to modify our plans and to devote more attention particularly to filling the permanent teeth. It did not seem to be a practical measure to endeavour to restore the temporary teeth while neglecting the permanent ones, and to allow the latter to fall into a hopeless state of decay. We therefore confined our efforts to the extraction of those harmful temporary teeth, and to the preservation of the permanent ones. That was our policy until the end of the year 1911.

RESULTS ACHIEVED.—In that year by a series of carefully compiled statistics we were able to show that there had been, for some reason or other, a distinct improvement in the condition of the temporary teeth. When we started there were more temporary teeth decayed among these children than sound ones, and the proportion of decayed teeth among the temporary dentition was as 11 to 9 sound

ones. In 1911 that proportion had sunk to 8, and it has now fallen to 5. That shows that the scheme as laid down—viz., the removal of harmful temporary teeth, of irritant roots of temporary and of decayed teeth, and at the same time this instruction with the toothbrush and the restoration of the permanent teeth to functional activity, had somehow broken up the vicious circle which was tending to destroy the temporary dentition as a whole.

EDUCATIONAL WORK AND ITS INFLUENCE.—I do not, however, and I did not at that time, claim that the changed methods were solely responsible for this improvement. There were a great number of other factors, and one of the principal was the important work that had been going on at the Welfare Centres and the general instruction of the mothers, expectant and nursing, in the proper management of themselves and of their offspring.

PART PLAYED BY CONSTITUTIONAL CONDITIONS.—That seemed to indicate what some may regard as a heresy: that constitutional conditions can have a powerful effect upon the prevention or spread of dental decay. We have had pointed out to us the importance of the right kind of food administered in the right manner and at the right time, and it has been urged that our housing conditions should be such as are conducive to health. All these matters had to be taken into consideration. It became at once apparent that we must remodel our views with regard to this disease and look for predisposing causes. I will not put it stronger than that.

STATISTICS: A SURPRISE.—Our first step was to examine carefully the statistics of Welfare Centres from the point of view of the feeding of the children—breast-fed, partly breast-fed, and bottle-fed. These statistics showed that there was practically no difference in the teeth of the children of five years of age between those breast-fed, partly breast-fed, and bottle-fed. This seemed to suggest that in some way or other our result conflicted with that of Nature. Yet she is not only a kindly but an infallible guide. I looked round and wondered whether we started our treatment at a sufficiently early age and came to the conclusion that 'we

did not. I began to examine little infants from three years of age, and to render them dental aid and treatment.

CONTAGIOUS DISEASES AND THE TEETH.—That brought me up against another series of propositions, viz., the endeavour to reconcile the reports of the medical officers with regard to the extent of contagious diseases and their effects upon children, estimated by the extent and development of the teeth at the time when these epidemics were prevalent, and the facts as we found them two or three years afterwards. I found that there was a decided developmental relationship between dental caries occurring during the time that the teeth were actually destroyed and the occurrence of epidemics. With the assistance of Mr. Richards and Mr. Ashton we worked out the examination results from vaccinations, measles, scarlet fever. We took 110 children who had never before shown the slightest signs of decay either in their temporary or permanent dentition, and contrasted their history with a similar number of children taken out of the same school, and therefore belonging to the same social orders, whose teeth were extremely bad. The exempted children showed much better weight and less disease of a general constitutional character than those whose teeth had been affected.

PREDISPOSING CAUSES.—All these things seemed to point in one direction, namely, that we must not eliminate from our considerations those causes that may predispose to dental decay. We made further researches and came to the conclusion that development causes must play their part. About the year 1914 I strongly advocated—and I am glad to think to-day that the measures then urged are now adopted by the Government—that the teeth of expectant and nursing mothers should receive the best attention that we can afford.

“CHERCHEZ LES GRANDMÈRES.”—We have to get back to the origin of the trouble, and if we are asked, “How soon should we bring our children to see the dentist?” we must reply, “In the days of their grandparents.”

With these introductory remarks I will more particularly address myself to the subject of my paper, viz., the importance of dental attention during first dentition.

COMPOSITION OF THE MILK TEETH.—The normal infant develops a first dentition of twenty temporary or milk teeth. Each tooth is a hollow cylinder of hard bone-like tissue, and about one-third of its length is ultimately exposed, in the mouth, when the process of cutting the tooth is complete. This exposed portion is known as the crown of the tooth. Being intended to undertake an extraordinary amount of wear and tear, it is protected by an outer covering of material even harder than the general mass of tooth tissue, in order that it may not be excessively ground down before its period of usefulness has expired. The non-exposed portion of the tooth, known as the root, is firmly embedded in the bone of the jaw. Thus the necessary degree of stability is imparted to the tooth, so that it may not be displaced, partially or entirely, in the performance of its proper functions. The hollow central part of each tooth is filled with the blood vessels, nerves, and soft tissues necessary to impart life and sensation to the hard outer casing.

VALUE OF THE FIRST DENTITION.—It is not enough, however, to study a temporary tooth as a single, separate organ. It must rather be regarded in its relationship to all the other teeth. Furthermore, a knowledge of all its functions and their duration must be co-ordinated with a general survey of the tissues and organs of the body. Such a survey enables the observer correctly to describe the first dentition, and to estimate its value as an essential factor in growth and development.

THE DENTAL ARCHES.—The twenty temporary teeth are arranged in two unbroken arches of ten teeth apiece, situated opposite to one another in the upper and lower jaws, the arc of the upper arch being slightly greater than the lower, causing the teeth in the latter to be overlapped and certain of the teeth in the former to be broader than the teeth they oppose. In addition to inequalities in breadth there are other differences apparent. Thus, in each arch, there are four incisor, or chisel-edged, teeth for the seizing and gnawing of food. These are situated at the front of the mouth, have a single undivided root, and are the first teeth to be cut and the earliest to be displaced by the successional permanent teeth. Farther back, on each side of the arch, are two molar,

or grinder, teeth, which have broad flattened crowns and two or more roots. Intermediate in position between the incisors and grinders on each side of the arch is a canine, or eye-tooth, whose bluntly pointed crown is not raised to such an elevation as to interfere with the side movement of the lower jaw, a most important characteristic of the human masticatory apparatus.

It becomes evident that a child depends not on a certain number of individual teeth, but on two dental arches nicely adapted to each other, that a break in one arch by the premature loss of a tooth is accompanied by a corresponding loss of function in the opposing one, and that the preservation of the whole dentition is necessary to infuse the maximum harmony of working capacity.

FUNCTIONS OF THE FIRST DENTITION.—The reduction of food by the process of chewing to a correct consistency, previous to the act of swallowing, depends until the sixth year of age entirely on the efficiency of the temporary grinders, while they continue to be in part responsible until the tenth year. Thus, during the period of greatest growth and development the child is reliant upon the correct interlocking of the first dentition. Moreover, the roots of these temporary teeth embrace, or are in close proximity, to the developing permanent teeth, and the correct adjustment of these latter entirely depends on the maintenance of an active first dentition to preserve and obtain the space necessary for their subsequent position by the functional development of the jaw through proper usage.

DISEASED CONDITIONS IN TEETH.—The preservation of the temporary teeth secures to the permanent teeth not only correct adjustment, but also freedom from contact with diseased conditions likely to weaken them during development, or cause their speedy decay after they have emerged into the mouth. A consideration of these diseased conditions, associated with the decay of the teeth, leads to the main issue, an appreciation of tooth sepsis in terms of resulting disease.

EFFECT ON HEALTH.—It would be a relatively trivial matter if decay of the teeth caused some pain and ended with a

lessened number of temporary teeth, or the presence of irregular second teeth, likely themselves speedily to decay and disappear. Even as the writers of classic tragedies obtained their effects by piling horror upon horror, so does the decay of a tooth gain an ascendancy over the general health that may threaten the very existence of an individual.

TOOTHACHE.—First there is the destruction of the hard tissues involving toothache, only particularly noticeable when sweet, acid, hot or cold substances are brought into contact with the affected tooth or teeth. This gives place to a more constant and enduring pain as the decay approaches the nerve tissue in the centre of the tooth. The patient now finds relief in cold solutions and increased pain with warm solutions. With regard to solid food, the patient endeavours to avoid biting on the affected side, a fact which throws one half of the masticatory machine out of use, and leads to the accumulation of filth round the unused teeth and to the imperfect chewing of the food. This in turn involves indigestion, leading to loss of sleep, nervousness, intestinal stasis, loss of strength through malnutrition, and lowered resistance to general constitutional disorders. If there be a painful area on each side of the mouth, these conditions are of necessity intensified by the patient bolting solid food without daring to chew it at all. In due course, if remedies are not applied, a further stage of decay is reached, in which cold solutions increase the pain and warm solutions allay it, while its character changes from a constant intensity to a throbbing, hammering, intermittent trouble. It is still impossible to chew, and sleep is now only induced when the face has been comforted by the application of a warm wrap.

ITS LATER STAGES.—These early symptoms of inflammation of the soft tissues of the tooth are succeeded by the extension of the trouble to those situated between the root of the tooth and the bone of the jaw forming the tooth socket. To exert pressure on the tooth now gives relief, and this stage marks the formation of an abscess in connection with the trouble. This implies the liquefaction of dying tissue and consequent accumulation of dead fluid or pus, which, being absorbed into the general blood stream by the neigh-

bouring veins, carries septic material to all parts of the body, with alterations of temperature and other symptoms of poisoning.

HOW MOUTH-BREATHING STARTS.—Nature abhors foreign, inert, or dead matter in the midst of living tissues, and will cause the abscess to track towards an open surface which may be a free space in the mouth, in the throat, between two muscles, or on the outside of the body, on the face, neck, or shoulder. Until such a vent is established the pain increases steadily, and soon the patient discovers that the slightest pressure, or an accidental rap on the tooth, aggravates the sorrow beyond endurance, and the mouth is now kept open to avoid shocks. This, in a child, is the beginning of mouth breathing, with its inevitable sequel of tonsils and adenoids, a lowered resistance to catarrh, influenza, diphtheria and affections of the nose, throat, and lungs. If a vent is formed inside the mouth the pain and swelling at once tend to decrease, but the formation of pus continues, and this is unconsciously and unceasingly swallowed. The gums also become diseased and a general stagnation ensues, with the collection of tartar and purulent mucous material of infective character.

POISONING THE SYSTEM.—While it is convenient to refer to pus being swallowed, it is the poison absorbed directly into the blood stream which is the more harmful, though both are methods of poisoning the individual. From the former gastro-intestinal conditions result, from the latter affections of joints, glands, and skin. Dyspepsia in childhood, and still more in later life, is often due to insufficient or diseased dentures, while malnutrition is akin to this condition.

FAR-REACHING CONSEQUENCES.—These sequelæ do not necessarily manifest themselves during school life. There are started, says Sir George Newman, by this line of intoxication, various forms of anæmia which tend to create a vicious circle, ever acting and reacting to the detriment of the health of the patient. From the enlarged glands may spring tuberculous infection, from the affected joints rheumatoid arthritis, from the skin acne, urticaria, and eczema. It frequently happens that when a child has a swollen face

the mother applies hot fomentations, or hot poultices, to the cheeks, with the result that the abscess is drawn to a point on the face and will burst and discharge. In these cases a permanent disfigurement is left in the form of a puckered scar, which, owing to the formation of internal scar bands, or cicatricial tissue, becomes more and more and more pronounced as the years go by.

CONDITIONS REQUIRING OPERATION.—There is a third class of case, in which the pus finds no vent either in the mouth or on the outside of the face, and where in consequence it tracks between two muscles or into the bone forming the substance of the jaws. In one event the muscles may be displaced inwards with sufficient force even to cause mechanical suffocation, or the muscles of the joint of the jaw may become affected, and partial or complete inability to open the mouth ensue. Each of these conditions may necessitate operations and, generally, anæsthetics to be administered, when the patient is in a most unfavourable condition. On the other hand, where the bone of the jaw is involved the pressure of the invading pus may cause portions of the jaw to be cut off from the proper blood supply, so that they too become necrosed and by their death add to the general trouble and misery. If Nature succeeds in finding a vent, the violent symptoms will subside, and decay may go on to the total destruction of the teeth. Here, sooner or later, the sharp, dead end of the root is found projecting through the covering bone and gum. This constantly irritates the cheek or tongue, according to position, with resultant ulceration, the formation of an unhealthy pocket, further discharge of septic material, and the formation of more scar tissue.

HOW IRREGULARITY AND DECAY ARISE.—Moreover, dead pieces of temporary teeth are not loosened by the usual processes of Nature, rather they persist, thus deflecting the permanent successors and being a direct cause of irregularity and decay of the second dentition.

AFFECTIONS OF THE EYE AND EAR.—The progress of the disease is further marked by affections of the eyes and ears, while in children predisposed to nervous disorders such as epilepsy or hysteria, it increases the frequency and severity of the attacks.

HANDICAP OF BAD TEETH.—In discussing growth and development, a distinction must be drawn between age in years (chronological) and age in development (physiological). Thus, at ten years of age the end of the first dentition period, a child with bad or deficient teeth was found to be only nine years and four months old physiologically, while a child whose temporary teeth had been preserved from disease until gradually replaced by permanent teeth was, at the same chronological age, ten years and three months old physiologically, a difference of nearly a year, or 10 per cent. Points noted in addition to the teeth were stature, weight, strength, lung capacity, growth of head and face and mental development, as indicated by school standing. In fact, at eight years of age the child with sound teeth is taller and heavier than the one with excessive decay, the benefits of an equal start being steadily lost after the sixth year. With dental attention no child need lose this equal start.

As the twig is bent, so is the tree inclined.

The CHAIRMAN: We have had a very interesting paper from Mr. Jones. It will be convenient if we take both discussions together.

THE TEMPORARY DENTITION IN HEALTH AND DISEASE.

By A. T. PITTS, D.S.O., M.R.C.S., L.D.S.

The problem of dental caries and its prevention was never more urgent than now, when we are faced with the task of replacing the ravages of war and reconstituting national health on a high level of efficiency. It is a many-sided one, comprising various factors, some still unsolved. Happily we know sufficient to be able to indicate the essentials in its causation and to lay down on broad lines the main elements of its prevention.

MILK TEETH: THEIR TWO-FOLD IMPORTANCE.—My theme is the temporary dentition, those teeth which are known as the milk teeth and which, because they are shed in childhood, have been in the past and even now are too often regarded as unimportant. I propose to consider the subject from two points of view. First, the importance of the

temporary teeth as the functional teeth of childhood ; and secondly, their importance as the predecessors of the permanent teeth of adult life.

From the point of view of time, decay of the temporary teeth is less material than decay of the permanent teeth, in that the former only last for about ten or twelve years, while the latter have to serve us for the remaining fifty or sixty years. This is, however, a fallacy. In the adult a state of equilibrium has been reached and growth practically ceases, whereas the child is growing fast. If we conceive of the body as an engine, in an adult the food, considered as fuel, provides for the daily expenditure of energy and also for what we may term the running repairs, but in the child we have a condition in which the engine has not merely to give out adequate energy, but also to convert itself from, say, a two-horse-power engine to a twelve-horse-power engine. From this aspect the temporary teeth are of the utmost consequence, for by them the food is properly subdivided, so that the digestive juices of the stomach and intestines can extract the maximum nourishment from it. If the teeth are functionless through decay, the food is not properly chewed and not completely digested, and, equally important, infection may spread from the mouth and gravely damage other parts of the body.

RARITY OF DEFECTS.—The care of the temporary teeth really commences before birth, since the deposit of lime salts in them, which makes them hard, begins before the child is born. It might be thought, considering the adverse conditions under which many mothers live during pregnancy, working when they should be resting, often with an insufficient supply of nourishing food, that so highly complex a process as calcification would be affected and that the teeth would show structural defects. Actually this is not so and defective formation of the temporary teeth is rare. Over a large and extended experience of many years, I have only been able to collect a few cases and not more than 1 per cent. of children show such a condition. We may say, therefore, that, in the vast majority of cases, the temporary teeth come through well formed and that pre-natal conditions, so far as their structure is concerned, play only a small part in predisposing to their destruction by dental caries.

VALUE OF SOUND TEETH TO THE GROWING CHILD.—Of the importance of sound teeth to the growing child I have already spoken, but it cannot be emphasised too much. Food well chewed is better digested than food bolted ; in the latter case some of it is passed out of the body undigested and so wasted. To use a homely illustration, what should be all cinders contains lumps of coal. Not only is the body deprived of the energy in this undigested food, but a great strain is thrown on the organs of digestion and the vigour and development of the growing child is likely to suffer.

ATTRITION.—Let us now turn to a point which not only illustrates the value of the temporary teeth to the growing child, but that has, I believe, an important bearing on the functional activity of the permanent teeth—attrition of the teeth. Attrition, or wearing down of the teeth, is an index of the activity of mastication. In prehistoric man, and to-day, amongst primitive races,¹ attrition is a normal condition ; long before middle age is reached the cusps are obliterated. In modern man this is not so and it is no longer a normal accompaniment of maturity. Attrition, to the extent of obliterating the cusps, is rarely seen in an Englishman of middle age, whereas it is quite common to find elderly people with functional teeth showing little signs of wear. On the other hand, in children attrition is a normal sign, and indeed its absence may be regarded as pathological. In a child of six with healthy teeth, we should find that the overlap of the incisor teeth is completely worn away ; the canines should show definite facets, while the molar teeth are less worn, though still showing signs of attrition.

MASTICATION IN CHILDHOOD.—Now, although the temporary teeth may be softer than the permanent teeth, yet the food of the average child is softer and requires less chewing than that of the adult. These two factors may thus be said to cancel out and leave us with the conclusion that the healthy child can and does masticate its food more vigorously than

¹ In the aborigines dental caries is, in the main, a disease of middle and old age, and one of its chief predisposing factors is "natural" destructive attrition. In modern white people, dental caries is a disease of all ages, particularly early childhood, and mechanical attrition as a cause plays no part whatever.—Brooke Nicholls, M.A.C.D., D.D.Sc., Melbourne, *Sixth International Dental Congress*, 1914.—Ed.

the adult. Here we have a striking proof of the importance of functional teeth to the child. It does not end there, for I believe that the efficient development of mastication in the adult depends on the presence of attrition in the temporary teeth and the physiological activity that it connotes.

A SAFEGUARD AGAINST CARIES.—It is now realised that the proximate cause of dental caries is the stagnation and fermentation of carbohydrate food in contact with the teeth. If we could eliminate soft clinging food from our dietary and replace it by food fibrous in character, with little tendency to adhere to the teeth, a great deal of caries could be prevented.

In addition to the immediate cause, there are various predisposing causes : crowding of the teeth, poor structure of the enamel, perversions of the salivary secretion, malocclusion, and an absence, partial or complete, of a proper habit of mastication. Chief of them is the lack of regular and thorough mastication. Conversely, vigorous mastication is our greatest safeguard against dental caries. Now mastication, as Dr. Sim Wallace has well shown, is a complex act in which not only the teeth and muscles of the jaw are concerned, but the tongue, palate, lips and cheeks all play a part. Of these the movements of the jaw are the most important and on them depend these other accessory factors.

MOVEMENTS OF THE JAW IN CHILDREN.—Attrition of the teeth is an index of the movements of the jaw ; when certain movements occur regularly and in a definite sequence, they are eventually registered on the teeth in the shape of attrition marks, and by studying these we can, to some extent, reconstruct the movements of the jaw which caused them.

The temporary teeth which show the most wear are the incisor teeth ; at the age of three, when the temporary teeth are in place, the upper incisors overlap the lower ones. This overlap normally disappears by the age of six and is due to a forward movement of the lower jaw. The canines are also worn and show definite facets ; this is caused by a forward movement combined with a slight lateral movement, since it is not possible to engage the facets of the upper and lower canines of both sides at the same time. The first temporary molars show a certain amount of wear as well, but less than the canines, while the second molars show still less wear.

From this I conclude that the main movement of the jaw in children is a forward one, combined with a lesser amount of lateral movement.

VARIATIONS AMONG ADULTS.—Turning to the adult and studying those cases in which attrition occurs, we find that the molars show as marked attrition as the incisor teeth ; in other words, there is a greater amount of lateral movement associated with chewing. Doubtless the range of possible movements in the jaw are the same for both child and adult, but what I am concerned with are the actual movements in daily use. In the other joints of the body practically the whole range of movements are employed in the course of our daily life, but in the jaw it is possible for some movements, or combinations of movements, to remain comparatively unexploited. The wider range in the adult are initiated and established with the eruption of the permanent teeth, especially the permanent molars. Temporary dentition movements prepare the path on which the fuller movements of adult life are grafted. If there is any deficiency, or perversion of the movements in childhood, we might expect that the movements in the jaw of the adult would not be so complete or efficient. Is there any evidence of this ? I believe that there is.

UNILATERAL MASTICATION.—In many adults, mastication is unilateral. Sometimes this is accounted for by absence of teeth, but often it exists in mouths where there are functional molars present on both sides. How does such a habit, for habit it is, come about ? One way in which it could arise is as a perpetuation of some defective habit of mastication in the child. It is a truism to say that a tooth which is tender is not bitten upon, and this is a common state of affairs in the temporary dentition. We often see mouths in which one side of the jaw is functionless through caries ; in such cases we find unilateral mastication and a corresponding attrition of the functional teeth. Later on, the permanent molars erupt and the movements of the jaw assume a wider range, but being grafted on the earlier movements which are restricted through disease, these are also restricted. An extremely slight amount of wear is sufficient to cause a nicely graduated path on the surface of the teeth which determines

the future movements of the jaw, so that when mastication commences, the teeth naturally take this path, just as we naturally tread in an existing track when crossing a meadow. This goes on and a path for the teeth becomes more deeply worn until unilateral mastication becomes a firmly fixed habit. In my own mouth, for instance, although I can chew quite well on both sides, I do so chiefly on the right side. If I move my teeth from side to side, I can more easily move them from right to left than from left to right. In the former case there is a series of attrition marks which allow the teeth to slide along easily, whereas on the left side these attrition marks are absent, with the result that the path is bumpy. If you will analyse your own movements, some of you will find that you have a degree of unilateral mastication.

ITS BEARING ON CARIES.—This has a direct bearing on the prevention of dental caries. Much of the food we eat has a marked tendency to cling to the teeth. If the mastication complex, as we may call it, is deficient, the tendency for food to cling will be greater on the side which is less used and the liability to caries will also be greater. Even if we could convert the nation to the cult of fibrous and detergent food, the existence of a habit of unilateral mastication would militate against its complete success. Time does not allow me to deal with other ways in which the temporary teeth influence the permanent teeth for good or ill. Enough has, however, been said to show how important they are, both in themselves as subserving the needs of the growing child and also as the precursors of the permanent teeth.

Mr. JAMES MCGHEE, St. Helens : Did you say that in the case of the 200 children the child with the better teeth had less incidence of measles and diphtheria ?

Mr. JONES : Yes.

CAMBRIDGE AS A MODEL.—Mr. PERCY ASHTON, L.D.S., School Dentist, Leicestershire County Council : I was fortunate, when starting as a school dentist, to be associated with Mr. Jones in much of his work as his assistant at Cambridge for over two years. After demobilisation I commenced a scheme of school dentistry in the county of Leicestershire, where I found the conditions prevailing much the same as Mr. Jones

first found at Cambridge, and which most school dentists find at first. Following out Mr. Jones's teaching, we decided to concentrate on the five to six and seven-year-old children, jettisoning all over that age, and to inspect and treat them where necessary every succeeding year till they leave school, adding the new five-year-old children each year. Thus, in seven years, all the children visited the first year will have grown up under dental care. I cannot, of course, myself see all the children in the county—there are over 30,000—but with assistance and time it will be accomplished.

AN ENTHUSIAST'S DREAM.—My committee wish me to enlarge slightly my sphere of operations by opening a clinic on Saturday mornings. ("Shame.") No, I do not think so, because I am enthusiastic enough to believe that it is not a dream to look forward to a nation with perfect teeth. This can, however, only be brought about by much steady hard work. While conferences on matters of diet and other research work will no doubt help us considerably, we must in the meantime accept matters as we find them, and endeavour, not to clean up the mess in which the nation's teeth are, but to prevent the younger generation falling into the same deplorable state.

TWO PRACTICAL QUESTIONS.—In view of what Mrs. Mellanby and Mr. Jones have told us, I would like to ask the latter whether he considers it better for me to devote this Saturday morning clinic to the treatment of older children in an endeavour to overtake arrears, or to giving attention to expectant and nursing mothers and putting their mouths in order, in the hope that by so doing their children will have better teeth. I should like to take back some knowledge from this Conference which will enable me more efficiently to advise my committee how to accomplish our object, which is to get the teeth of the people in Leicestershire, well, not perfect, but as near perfection as possible. (Hear, hear.)

PLEA FOR RACIAL STATISTICS.—Miss MAY YATES, Hon. Secretary, Bread and Food Reform League: As one of the speakers referred to the importance of studying the grandparents, might I suggest that it would be useful to study racial statistics? Patrick and Mummery made extensive

researches amongst various nations. They found that nations that lived almost exclusively on large quantities of meat like the Esquimaux were celebrated for good teeth, but when you get people who use large quantities of meat and add to that white bread, as the Australians, you get very bad teeth. I am not giving you any reason, but stating the facts. The inhabitants of Southern Asia, who live principally on whole wheat meal and unpolished rice, with plenty of fruit and vegetables, have remarkably good teeth. They have only 2 per cent. of caries as against 90 to 95 per cent. found amongst the colonials of Australia. I ask you to consider racial statistics, and perhaps we may be led to some broad and satisfactory conclusions.

INCIDENCE OF CONTAGIOUS DISEASE.—Mr. JAMES MCGHEE, St. Helens: Would one be justified in inferring that the incidence of infectious diseases had increased because dental caries has increased during the last century?

I asked you, Mr. Jones, about these two separate hundreds of children. You said that those with better teeth had less incidence of measles, scarlet fever, and diphtheria. If dental caries be the predominant factor, why is there a marked difference in the incidence of measles, which affect about 90 per cent. of children, scarlet fever about 23 per cent., and diphtheria about 15 per cent.?

BANANAS—A QUERY.—Mr. T. C. HORSFALL, Manchester: I have been told that people in Zululand, who live largely on fruit like bananas, have remarkably fine teeth. I should think that bananas would rather cling to the teeth. I do not know whether it is one of the cleansing fruits.¹

VALUE OF SYSTEMATIC EFFORT.—Mr. JONES, in reply: Mr. Ashton asked whether he could better devote extra time to the treatment of expectant and nursing mothers or to children of eleven years of age. The success of the Cambridge scheme has been largely due to the fact that we have followed

¹ The speaker correctly assumes that the banana is not conducive, as is juicy fruit, to the practice of oral hygiene. It is a bread-stuff, of which our diet already contains an excess, rather than a fruit. Its unripe condition when usually eaten here, supplies an additional objection. For the food value and hints on the selection and use of bananas, see *Facts for Patriots*, 2nd series, 4d.—Ed.

it up year by year ; ultimately sending 84 per cent. of children of 14 years of age out of school with no decayed teeth. That has only been achieved by working systematically. It would be obviously impossible for Mr. Ashton to see anything like a reasonable proportion of these children over 14 who have arrived at a neglected condition as a result of the delay of the Educational Authorities in Leicestershire in appointing a school dentist until last year.

NEED FOR UNIFORM TREATMENT.—Again, these schemes, it must not be forgotten, are administered out of public funds so that their promoters have no right to say “ You shall be treated and you shall not be treated,” other things being equal. Therefore, if Mr. Ashton were to take on these arrears of work, it is obvious that he would have at once largely to increase the dental staff.

METHODS IN A COUNTY.—On the other hand, in a county like Leicestershire, you may have 1,500 children of 14, but you will probably not have more than 1,000 mothers altogether to deal with. You can accordingly offer systematic treatment without any privilege to that section willing to accept. Preventive dentistry must proceed in stages. The first step is to endeavour to prevent the decay from utterly ruining the second dentition. When that has been overtaken sufficiently, the scheme should be extended downwards through the infants’ school and an effort made to preserve the temporary dentition. Then go back to the expectant and nursing mothers. The latter development is, perhaps, beyond the school dentist and may be ultimately dealt with by the nation under National Insurance. I would see that children over 14 left school with 28 sound teeth ; none of them decayed. The Leicestershire County Council and even Bolton, the “ metropolis ” of a great district, and some of our other big towns, have been backward in appointing anything like the proper number of school dentists.

“ KISSING ” THE SHUTTLE, AND “ WEAVERS’ TEETH.”—The cotton industry, again, is carried on in a damp atmosphere, with minute particles of cotton flying about, sufficient, at least, to cause a stranger entering a weaving-shed considerable respiratory inconvenience. Not every weaving-shed is

equipped as it should be and, in a good many, weavers have to "kiss" the shuttle. In some researches on this subject over twenty years ago, I was fortunate enough to get hold of one of those indiscreet men who combine honesty with indiscretion. He informed me that where the cloth was of inferior quality, the size through which the shuttle had to pass was loaded with metallic substances and that the teeth of the weavers in these sheds were characteristically known as "weavers'" teeth. These inferior qualities of cloth were exported abroad to the least civilised parts of the world and were heavily weighted, as well as being heavily woven. It was the custom to add zinc, perhaps lead, or other metallic substance, with the result that every time the weaver "kissed" the shuttle, it tended to produce "weavers'" teeth, a round dark cavity between the two central incisors.

INITIAL DIFFICULTIES.—You have thus two difficulties to contend with. First of all, the neglect of public authorities, who have not appointed dentists in sufficient numbers, and secondly, the unhealthy occupation of some of the people when that occupation is, as sometimes, carried on with the least amount of cotton and the heaviest amount of sizer. (Laughter.)

SALARIES.—As to dentists taking up school dentistry whilst salaries are what they are, it is not entirely a question of salary. We dentists belong to a profession, and the professional man has a certain amount of interest in his work, apart from that material interest which perhaps might cause the bread to be buttered on both sides.

I also concur with Dr. Wilkins with regard to the School Medical Officer. Surely this work of prevention should be as well paid as that of the private practitioner. He goes round to cure; we are trying to prevent. The private practitioner has many expenses that the official has not. He must have a big staff which he has to pay out of his own pocket and he has very often to live in a style which is not necessary for the despised and rejected bureaucrat. (Laughter). He has to pay for materials, which are provided for us, and for general upkeep. These items should be discounted, but even then the net result should be borne in mind in determining the salary of public officers.

SCHOOL DENTAL SERVICE.—Moreover, even if you offer School Dentists two thousand a year, they would not be satisfied. (Laughter.) We are men, and ambition and emulation are dear to the heart of any man. You must make this position lead up to something; you must have men—super-men if you like, until you get the School Dental Service equal to the School Medical Service, each member endeavouring to obtain a higher grade on the ladder. That advance is more important than money. (Hear, hear.)

MEDICAL INSPECTION.—With regard to the charting business, I do not think that medical inspection has entirely failed. School dental work is only in its infancy and we must take long views.

STATUS OF THE DENTAL PROFESSION.—Some one said that there were not enough dentists to overtake all this trouble. Would people be willing to have it overtaken, if you had the dentists, and what inducement is there? We must look to the State to give us a lead by affording an adequate measure of protection to that section of the dental profession which has taken the trouble at least to present its credentials in the usually accepted form. There will then be some inducement for the best men to come in and take up the profession seriously.

WHERE SCHEMES SHOULD START.—Dr. Wilkins asked how we could best employ one dentist on 5,000 school children. Is Stafford a town with a floating population?

Dr. WILKINS: No.

Mr. PERCY ASHTON: It is important when schemes are started, in order to obtain results, not to begin in a place where the population is floating. Dr. Wilkins would find one dentist is quite sufficient if he started with little children. Afterwards, in the fourth year, when these inspections were going on annually, he would probably want a second dentist appointed.

FILLINGS.—Mr. Watt spoke about fillings. The men who are called upon to do this class of work, should be the best skilled. It is utterly useless to do work of a temporary character. Get the best men and material and try and make the work as permanent as possible.

INCIDENCE OF DISEASE.—The incidence of disease has altered. Certainly, with regard to diphtheria, it is admitted that what was previously a rural complaint is now urban. Some towns seem totally unable to shake it off.

A GREAT FIRM'S DENTAL CLINIC.—Mr. J. HOLLIS DENNIS, L.D.S., Messrs. Tootal Broadhurst, Lee and Co., Ltd., Bolton and Manchester: This Conference has been looked forward to by me with great interest. I have charge of Messrs. Tootal Broadhurst, Lee and Co.'s dental clinic, at their Sunnyside Mills, Bolton. They are a very philanthropic firm and recognise that the teeth of their workpeople must have attention, as well as their general health. They have also a physician attached.

A DEPLORABLE EXPERIENCE.—It is a cotton weaving and spinning mill and we get the children when they are over 14. My experience among them has been most deplorable. Out of about 500 examinations of children between 14 and 16, I have only found some two cases where the mouth has been free of caries. It was quite impossible for a part-time Dental Surgeon to take all this work in hand, because in every mouth there was an average of at least ten to twelve carious teeth. If you multiply that by three hundred, you will see how hopeless it is for anyone, in one afternoon per week, to attend to all.

GRAPPLING WITH THE PROBLEM.—I decided that the best thing to do, in conjunction with the medical man, was to find out the worst mouths. These were cleared out of septic roots and bad abscesses. The health of those who have had their teeth treated immediately improves and they are brighter altogether. We have proved this. We have not got statistics, but those people who are fond of them can have basketsful from many other sources.

OBSTACLES TO PROGRESS.—From what I have heard in this Conference, dreadful things come upon you if you neglect your teeth. We all know that, and the public know that anything can happen with a septic mouth. What we want to tell them is that this can be avoided if the children have their teeth attended to. Now the obstacles that we are up against are two. The first is the ignorance of the general public about the teeth and their value, and the second is

finance. (Hear, hear.) You go to an Education Authority, or any Authority, I do not care what it is. The Director of Education said to me : " Look here, what about teeth ? " I asked, " How many children have you got, 37,000 ? " He replied, " Yes. How many dentists would it take to get 37,000 children's teeth in dental order ? " I said " 37." He enquired, " What will it cost to get 37 dentists ? " (This was pre-war.) I said, " Five guineas a week each," and he looked astonished.

ROOT OF THE MATTER.—They waste money with their Medical Officers in this way. It does not do a child any good to look at its mouth and to say, " This child has got decayed teeth," and put that on a chart. It's not any use trying to improve the child's health if you are going to leave the teeth unattended, whatever it is suffering from. You naturally wish to give that child nourishing food, but if it has septic poisoning from bad teeth, you might as well throw the food in the gutter.

I hoped to hear and have heard a great deal of the interesting work of Mr. Jones at Cambridge. We want to try to keep the permanent teeth undamaged. These are the ones that are going to take a child through life. The temporary teeth, I admit, however, are all-important. The money should be spent at the right end—viz., when the child goes to school. That costs money.

THE DENTIST AS DEMON.—You cannot take a child by the scruff of the neck and say, " You are going to have your teeth attended to." It is contrary to the law of the land. I have seen children come into my surgery who could not spell the word dentist, but believed that he was a demon. (Laughter.) The parents told them. A lady came to me one day and brought her little girl. The child was scared to death. I said, " Madam, who told this child that dentists were fiends incarnate ? It was not born in them naturally ; it's either you or the nurse." I said to the little girl, " Come here, I'm not going to hurt you, and sit on that chair. Anything that your mother or nurse has told you is not true." (Laughter.) You also want to take an interest in the children and in their pastimes. The little kids come to me, really

bright little children. Why? Just because I have treated them as children.

WHY DENTISTS CANNOT BE ABOLISHED.—In the States people think nothing of the dentists. They go to them regularly every six months. Professor Adami said that we wanted more dentists. With all respect to Dr. Harry Campbell, who said, "You do not want any—we want to get rid of them," you do want dentists, you want a great number, because you cannot undo the past. In years to come you can reduce them, if you get hold of the present generation.

As to the money difficulty, you cannot get men to work for nothing, and if the nation expended £1,000,000 or so in dentistry, it would come back to it a thousandfold. I feel strongly on this point and I am pleased to have had the honour of addressing this Conference. (Hear, hear.)

A SHORT-SIGHTED POLICY.—Dr. ARTHUR G. WILKINS, Senior Medical Inspector, Staffordshire County Council: I am a School Medical Officer and wish to express my cordial agreement with the last speaker on the subject of the salaries of school dentists. It is ridiculous what we expect to get dentists for. We employ over 2,000 school doctors and pay them salaries to examine children, four-fifths of whom are perfectly healthy, except for decayed teeth, which we then proceed to card index. It would be better to fill hollow teeth than to card index them and better still to prevent a large amount of caries on the lines suggested by Dr. Wheatley. I distrust school-medical statistics when I find webbed fingers, phimosis, flat foot and undescended testicle all recorded as occurring in '03 per cent. of cases in the records of a distinguished school medical officer.

ANOTHER OFFICIAL'S PERPLEXITY.—How can I do the most good with one dentist in a town like Stafford with a population of 28,000—that is, 5,000 school children? Should I concentrate on the war babies of 5, 6, or 7, or should I clean out the septic mouths, or work for expectant mothers?

METHODS AT BOURNVILLE.—Mr. T. P. WOLSTON WATT, L.D.S., Senior Works Dentist, Messrs. Cadburys, Bournville: I am sorry to intervene again so soon. Having, how-

ever, listened with interest to another Factory Dentist from Messrs. Tootal Broadhurst, I decided that a general idea of our methods at Bournville might be of interest.

A CONDITION OF CHILDREN'S EMPLOYMENT.—We make it a condition of employment that no child is taken on under 16 years of age, whose parents do not sign a form authorising the works dentists to do whatever is considered necessary. If they, the parents, say a child must not have its teeth out or filled, we reply, "You have signed a paper authorising us to do what we consider right, and we can go ahead."

NATURE AND EXTENT OF TREATMENT.—All applicants for employment are examined by the works dentist, and if the child is under 16 years of age we take full particulars as to the number of cavities, etc. If anybody wants statistics, I should be glad to let him have them. The percentage of good teeth must be considerably higher with us than in Bolton, because of thirty odd youngsters I examined last week, four had, so far as I could see, perfect mouths. We get rid of all unhealthy teeth and roots first. After that we do all forms of dentistry, even gold fillings, gold inlays and root treatment, and the work is free to all who enter the works under 16 years of age. Besides treating youngsters, we also attend to those over 16, so that two dentists cannot properly carry out a proper six-monthly examination. We cannot in fact, treat all our young employees. I am hoping shortly to increase considerably the dental staff, but at present we are held up for want of accommodation.

DENTAL ATTENTION AND INCREASED OUTPUT.—In addition to working for those young people, we do all we can for the older employees, in the way of relief of toothache and removing bad teeth. We do that as we find that there is far less time wasted and therefore an increased output. It is better for the employee to attend at the dental department rather than spend half a day going to town or to a dentist outside, while by coming to us, possibly an hour suffices. We always insist that they shall not go back to their work until all bleeding is stopped. We also do a certain amount of "mechanical work." At first we did not attempt this work. We came, however, to the conclusion that it seemed unfair

that a child, with a mouth hopelessly neglected and with hardly any good teeth, should be penalised by having to go outside and pay a big fee, when another child, with fewer bad teeth, could occupy the time of our dentists in filling the teeth free.

THE "ACID TEST" FOR EMPLOYMENT.—I have made it a sort of arbitrary rule that if applicants for employment have ten or more cavities, that they be not employed, because we have got the impression at Bournville that a number of bad teeth necessarily go with an impaired constitution and therefore lessened capability for work. Accordingly I recommend that they be rejected. If a doctor, however, thinks them physically fit and they seem desirable employees from other points of view, I advise them to go to the dental hospital or to a private practitioner, and they are taken on if the fillings, etc., are satisfactorily done. In that way we do endeavour to keep out the serious cases of caries. We cannot, however, cope with all the work and are looking to the school dentists to help us by sending us young employees with teeth free from caries.

A PROPHECY RECALLED.—Ten years ago I had a talk with one of our directors. He thought that, instead of increasing the dental staff, we should probably diminish it, because the school dentists were coming along. I said, "Yes, in ten years' time we shall begin to feel the benefit of what the school dentists are doing." It is only quite recently that we have noticed the advantage of the school clinic work, in the improved dental condition of young applicants for employment.

THE IMMEDIATE PROBLEM.—The problem before us is to work on the children first, get them all properly looked after and follow up by the factory clinics. We shall then have some chance of securing a fairly sound set of teeth for all our industrial workers. They will not be perfect, but we shall have gone a long way towards solving the problem of dentition defects.

Mr. A. T. PITTS, in reply : I really have nothing much to say. The discussion has largely resolved itself into one on school dentistry. I have listened to Mr. Jones's paper with

great interest and I can testify from personal experience how good is the work of the school dentist.

SATURDAY, MAY 15TH.

FIRST SESSION.

CHAIRMAN, EDWIN HOUGHTON, L.D.S., President, East Lancashire and East Cheshire Branch, British Dental Association.

Letters were read from Mr. Doswell Wallis, regretting his inability to attend the Conference and expressing gratification that Mr. Lindsay had consented to represent him.

The CHAIRMAN : You have heard why we have not the pleasure of Mr. Doswell Wallis's presence. His paper is in good hands and Mr. Lindsay will deal with the matter authoritatively.

SOME THOUGHTS ON THE PREVENTION OF
DENTAL DISEASE AND IRREGULARITY.

By C. DOSWELL WALLIS, L.D.S., F.C.S., Eng., M.I.H., *Chief School Dentist, West Sussex and Chichester Joint Education Committee.*

A CURE FOR TOOTHACHE.—As the Irishman said : “The best cure for toothache is not to have it.”

Although dental caries is, unquestionably, the most common of all diseases affecting civilised mankind, it is also one of the most easily preventable, being almost entirely the outcome of our artificial mode of living and unsuitable diet. This distressing complaint, which is, moreover, a root cause of various serious diseases and a contributory cause of many others, leads to much inefficiency and loss. It should be the earnest endeavour of every one concerned (and who is not ?) to stamp it out.

The only hope of combating successfully the enormous amount of dental disease is by *prevention*, as any attempt at cure, after this condition has become established, is a hopelessly vast proposition. One of the most important factors in prevention is attention to correct diet.

WHEN DISEASE STARTS.—It has been established by observation and research that indications of caries and other abnormalities are visible, in a considerable percentage of

instances, as early as the eighteenth to twentieth month of a child's life. Preventive measures, to be effective, must therefore be commenced during the earliest months.

Further, the teeth are actually growing (in crypts in the jawbones) for many months before they erupt and make their appearance in the mouth. Accordingly, success depends on the maintenance of normal and healthy conditions in expectant and nursing mothers, as well as on care in the training and management of young children.

PROPHYLAXIS OR PREVENTIVE MEASURES.—The scientific term for preventive measures is Prophylaxis. It is derived from the Greek word signifying "the vanguard of the army," and implies that prevention is but the beginning, should be but an advance guard, and that regular "following up" by experts is essential.

The method by which sound, normal dentures may be secured by all is quite simple, and consists in getting back, as far as is feasible, to natural conditions in the mouth and body generally.

The two chief factors are :—

1. Suitable diet.

2. Sufficient exercise of the jaws and teeth.

1. *Diet.*—This should be of such a nature as to leave the mouth and teeth physiologically clean (not surgically clean), and of such quantity and consistency as to provide for the second point (exercise). The whole problem resolves itself largely into a question of food. Certain kinds, especially that of a starchy nature, more particularly when it tends to cling about the mouth, form by processes of fermentation products most detrimental to the teeth. Moreover, a faulty diet, especially when coupled with lack of sufficient exercise, has a harmful effect upon the juices secreted in the mouth (both as regards quantity and quality) which is reflected in the condition of the teeth and health.

2. *Exercise.*—It is a matter of common knowledge that, if any part of the body gets an abundance of exercise, it tends to become strong and big. This applies with equal force to the jaws and teeth. Exercise is of special importance during the early months and years of life, when the teeth are growing and developing. It provides a plentiful blood supply to the

jaws and surrounding tissues, thus ensuring a generous amount of nutriment for their work to the tooth-building cells.

This is the more essential since, once the teeth are fully formed and in position, little or no change is possible in their structure, and unless they are free from imperfections they are more liable to decay.

Again, a liberal blood supply and a well-developed jaw ensure that there shall be sufficient room for the second (permanent) set of teeth when they erupt to take their appointed places in the dental arch. Overcrowding is one of the commonest forms of irregularity.

MEDICAL CURRICULUM : A CRITICISM.—The pernicious habit still persists of feeding small children as though they were invalids. This is in a measure due to the advice and instructions given to parents by the average doctor who spends many years in the study of diseased conditions and their cure, but gives little time or attention to the preservation of health. The whole idea of prevention is the maintenance of a healthy state of all the tissues and functions of the body.

INVALID FARE FOR A HEALTHY CHILD.—The prescription of what is practically an invalid diet for normal young children, instead of hard, coarse food, such as a child enjoys and can easily masticate and digest, is quite illogical, has a disastrous effect upon the dentition, and lays the foundation of many bad dietetic habits and diseases.

RESPONSIBILITY OF THE INDIVIDUAL.—Apart from expert advice and supervision by specialists, the responsibility for obtaining satisfactory results rests with the individuals composing the general public, and more especially with parents and those entrusted with the care and upbringing of young children. Preventive measures to be effective must be constant and continuous in their action and influence, and concern details of ordinary daily routine.

PROPAGANDA CAMPAIGN NEEDED.—To bring the importance of prevention home to the masses of the people and to give them guidance as to the simple steps necessary to take, a widespread propaganda campaign must be undertaken. Much good influence may be exerted through co-operation

with infant welfare centres, schools for mothers, schools, boy scouts, girl guides and such like institutions. All nurses, midwives, health visitors, superintendents and assistants at welfare centres, crèches and the like, school teachers and others in close touch with the young should be given facilities for acquiring information. Medical officers need to study the question and to gain a deeper insight into the relations between general health, food and the teeth and mouth.

METHODS.—Lectures, demonstrations, kinematograph films, literature, leaflets, etc., should be prepared. A staff of lecturers is needed who, besides having an intimate knowledge of the subject in all its bearings, are capable of making the instruction given simple, interesting and attractive. The sympathetic countenance of Government Departments, local authorities, film producers, local newspapers and magazines must also be secured.

RURAL DISTRICTS.—The organisation and carrying out of propaganda work is a fairly simple matter in urban and thickly populated areas, as there are many facilities. Even in rural and, especially, agricultural districts, except in remote, isolated or scattered neighbourhoods, there exist many possibilities. Thus, most villages now have a hall or church-room, where lantern lectures and exhibitions could be arranged. There are often also men's and women's clubs, debating societies, mothers' meetings, women's institutes and similar assemblies, which would welcome interesting lectures and talks, besides schools, scouts, etc., and the parish and school magazines.

In conclusion, preventive measures must be undertaken by the public in general and by mothers in particular. Without the requisite knowledge and advice, however willing and eager people may be to do what is best for their children, this is obviously quite impossible.

PREVENTIVE MEASURES REQUIRED.—The CHAIRMAN : We have listened to a most interesting and practical paper. Prevention of dental disease is now the one subject that the public, with the medical and dental professions, will have to consider and decide upon the best measures to adopt. Up to now we

have been using inferior means to deal with the problem and have barely touched its fringe.

LOSS TO THE NATION.—First of all, we shall have to bring home to the general public the actual cost to the country in loss of productive power, due largely to the effects of dental diseases. It was brought home to us during the war. Many of the difficulties connected with recruiting for the Army were entirely owing to dental defects; 70 per cent. of the recruits had to be dentally treated before they were fit for active service.

LIGHT FROM NATIONAL INSURANCE.—Take again the statistics in connection with National Insurance. In looking through the Blue Book I found that, in the last four or five years, an average amount of four million pounds per year has been paid to the medical profession for attendance on insured persons, and you must add to that the cost of the drugs. It is generally acknowledged that one-third of the disease that insured persons suffer from results from dental causes, so that we have a waste every year of something like £1,250,000. If we had, in connection with the Ministry of Health, an active dental department, properly equipped and staffed, in ten years there would be a tremendous change for the better. The efforts of a society like this must be devoted to bringing pressure to bear upon the Ministry of Health to constitute such a department, including a research department, able to find out some of the causes and to deal with them.

PENNY WISE, POUND FOOLISH.—During the war there was considerable difficulty in remedying dental defects, the Government being afraid of the financial side. I had an opportunity of investigating the accounts in one of our large Army commands, bearing on the cost of rendering men dentally fit for service. I was surprised at the small figure. The average cost of treating 87,000 men, extracting the diseased teeth, doing the necessary fillings and providing dentures, worked out at 3s. 11d. per head. That covered all expenses, rental for clinics, cost of equipment and material. The only expense not included was that of central administration.

HOW THE COST MIGHT BE MET.—If you could get a definite

contribution from school children, say of a halfpenny, or a penny, per week and from the industrial classes of somewhere about the same amount, it would largely cover the cost of dental treatment of the nation.

A LAYMAN'S EMBARRASSMENT.—Mr. T. C. HORSFALL, Manchester: Every sentence in the admirable and lucid paper must commend itself to all of us and give us a strong desire to find an opportunity for taking part in the work of enlightenment. We are told that babies and young children should not be fed as though they were invalids, but should have hard, coarse food, such as their dental equipment is designed to cope with. How is an ordinary layman to find out what is such food? I have many grandchildren who often come to my house and I would give much to acquire the knowledge which would make staying there a blessing to these children. I regret not having given them hard, coarse food and also my own children. How, again, should porridge be made, so that instead of being a curse to the nation, as it appears to be in many cases, it may give good results such as unquestionably it formerly yielded in the Highlands? Will the representative of Mr. Wallis kindly tell poor, helpless people like myself where we can get this necessary knowledge?

NEED FOR RESEARCH.—Mr. H. P. SHOESMITH, L.D.S., School Dentist, Huddersfield Education Committee: I have much enjoyed Mr. Wallis's paper so ably read by Mr. Lindsay. Indeed all the papers have been most enjoyable and instructive. I agree that we must concentrate on prevention. If all the lessons taught are taken to heart and put into practice, we shall be justified in expecting a vast improvement in the nation's teeth. At the same time, I am greatly impressed by the divergence of opinion on vital matters. It shows that there is need for more research work. Here the Government should give us the lead.

A MELANCHOLY CONTRAST.—Surely it is as important to the nation to be able to combat mouth disease in man, as it is to combat foot-and-mouth disease in animals. What a boon to mankind it would be, if we could produce immunity from dental caries by the injection of some vaccine.

RURAL DISTRICTS—THE MAIN DIFFICULTY.—A HEALTH VISITOR:¹ In rural districts the great trouble has been the dental work done by untrained men. I have in mind the case of a mother who recently attended my Infant Welfare Centre. When trying to find out the reason for her bad health, I asked about her teeth. She said, "Oh, yes, my teeth are quite all right; I have a full good new set." She took them out of her mouth and I found it full of disease. The artificial teeth had just been put in on the old teeth! What can be done to provide us with the names of qualified dentists residing within our areas, so that we may give the information authoritatively to people who come to us on health matters? Naturally we do not want to run down good workers, but at the same time we want to know who is qualified and who is not.

THE FOOD FACTOR IN PREVENTION.—MISS MAY YATES, Hon. Secretary, Bread and Food Reform League: The paper lays stress on the prevention of disease and that has been the whole trend of this Conference. I hope, therefore, that you will direct attention to the food question, as one of the chief factors in the predisposition to dental caries.

WHERE LITERATURE AND LECTURES MAY BE HAD.—The Food Education Society has important books and leaflets on the subject, which show you how to cook various foods. You can get all these books at the stall.² You should also secure the valuable services of Miss Petty,³ who will show you how to make the most beautiful dishes and at the same time give you information about the scientific value of food, which will enable you to prevent this terrible disease of dental caries.

¹ The name of the speaker is omitted by request.—Ed.

² Miss Petty was in charge of the stall throughout.—Ed.

³ Experience in Manchester teaches that the most fertile cause of "poor physique" in children is the gross ignorance of the simplest forms of domestic economy and cookery amongst the mothers. . . . The difficulty was not due to poverty (except in a practically negligible number of cases), but to the lack of knowledge of the mothers (who could have afforded to buy the necessary food) as to how to cook it. It would appear that the scientific method to deal with the question of "poor physique" is to begin by due instruction of the elder girls in the schools and of the young women in the continuation classes in artisan domestic economy.—*Report of Ministry of National Service, 1920.* Cf. also *The Pudding Lady*.—Ed.

Mr. ROBERT LINDSAY, Dental Secretary, British Dental Association, in replying for Mr. Doswell Wallis: The reason why there has been comparatively little discussion this morning is, no doubt, that the subject was more or less dealt with on Thursday and Friday and that many of the chief protagonists have left.

ANOTHER SCOT ON PORRIDGE.—Mr. Horsfall will find, in the report of Miss Yates, a certain amount of information on the subject of porridge. As made in England and, I am sorry to say, in many parts of Scotland, porridge is not what it ought to be, so far as its consistency is concerned. If thoroughly well boiled and stiff, it constitutes a food which requires mastication and ought to have it. A short time ago, being at breakfast with a Canadian, I noticed him eating slices of toast with porridge and, on enquiring the reason, he said, "I do it in order to make me chew my porridge." It would not be a bad idea, where you cannot persuade the cook to make porridge upon the old Scottish principle, to give a child slices of hard baked toast and insist on this being masticated with the slippery porridge.¹

CHILDREN'S DIET.—As to the kind of hard, coarse food which my friend Mr. Wallis wishes to be eaten by children, I am sure that the Honorary Secretary of the Food Education Society will provide you with an ample supply of menus.² It is not necessary that the food should be quite hard. The general rule upon which we go in recommending the dietary of a child, say from 18 months to 8 years onwards, is that, with judicious care, it should have the food that the parents are having. If they are feeding properly, the child will come to no harm. Long before the second year the child has a magnificent dental apparatus, perfectly adapted to the mastication of coarse food. I am sure that this Society will put them right as to the feeding of children.

DISAGREEMENT—A HEALTHY SIGN.—I am glad that there has been a certain amount of divergence of opinion—that is a

¹ "Scrunch" (stale bread dried in the oven) is often used in the same way. It should be so brittle that children changing their teeth, or adults inadequately supplied, can use it.—Ed.

² See *Dietaries*, 1s. 3d.; *Feeding of Young Children*, 3d.; and *Feeding of Children*, 3d.

healthy sign. This divergence is better suited to discussions in our scientific societies and arises from the fact that the cause of dental decay is not known. It is largely caused by the presence of carbohydrates about the teeth, by imperfect dentition and by bad habits in eating and faulty feeding. We are not, however, satisfied, speaking scientifically and as investigators, that, when you have reformed your methods of eating and feeding, you will have banished dental decay, because there is something beyond all that. If carbohydrates lying about the teeth are not properly cleaned, there will be a large amount of dental decay. That was all that Dr. Sim Wallace and Dr. Harry Campbell meant to suggest. We need not worry about other causes, but can attack that in the meantime.

RURAL PROBLEM.—A Health Visitor has spoken on a subject which is much before the minds of the dental profession and of all interested in the health of the people. If she is ever in a difficulty, she may apply at our headquarters, where much of my time is taken up with giving such information to various public bodies. No doubt, however, she works in connection with some school dentist and an application to the nearest one will put her right. This country is unfortunately suffering from a serious incidence of untrained and unskilled dental treatment and the sooner the Ministry of Health takes measures to put an end to it, the better for everybody concerned.

PLACE OF TREATMENT IN THE CAMPAIGN.—Having read the paper, perhaps I might be allowed to close the discussion. We are here at the summing up of the dental side of this whole question. Our attention should be mainly directed to methods of prevention, but we must face the situation as it exists. We know that infinite damage is being done to the national health by the condition of our teeth. In addition, therefore, to the campaign of prevention, we must have a campaign of treatment.

THE IMMEDIATE NEED.—It has been said that the Great War was a war to put an end to war. Yet for that very purpose you had to multiply your soldiers by an extraordinary

number. In the same way, this great campaign which is opening up in connection with health is going to provide means which will put an end, we hope, to a large amount of dental decay. The only way in which you can tackle that problem now is by the provision of a more skilled dental service for the mass of the people. We must take care that they shall receive the same skill and attention as may be obtained by their more fortunate brethren. We shall manage that.

A WAR ANALOGY.—You remember what the Chairman said with regard to the treatment of the Army during the war. There, after a long and disappointing struggle on the part of the dental profession, the War Office did begin, at the end of the war, to have a satisfactory dental service. The result was that all the men who constituted the Army and have come back to civil life have received great benefit. They have been treated dentally in a way that they never were before. If we can treat in much the same way the general mass of the population, and more especially the women workers and the mothers, the amount of good resulting to the community will be immense. The expense, as our Chairman has pointed out, will be more than justified by the saving, not only in national health and prosperity, but also on drugs and medical attention, which constitute a large element of the expense under the Insurance Act. Side by side with this treatment, let us go on with the campaign of prevention and let us begin as early as possible.

CASE FOR EARLY TREATMENT.—My friend Mr. Jones, in his paper, spoke in a tragic manner of the consequences of dental disease, but I felt a feeling of relief at his last few words (which he did not emphasise), that if children were given proper dental attention these consequences may be averted. What we must get people to understand is that this treatment must begin early. It ought to begin with the grandparents of the children. We are commencing at last with the nursing and expectant mother. Then we are going to have Child Welfare Centres, because we must get at the children before school age. The School dentists are simply overwhelmed with work, patching up permanent teeth which

never should have decayed. We must also carry on this work in the schools from an earlier stage.

HOW INDUSTRIAL FIRMS VIEW THE PROBLEM.—You have had from one or two dentists in great industrial concerns facts about the treatment given there. You may take it that hard-headed business men do not institute these dental clinics at an expense to themselves, unless they expect to reap some benefit.¹ Similarly the nation will benefit by this public service. The expense, which seems to frighten so many and particularly our local authorities, will be justified.

DENTAL PROFESSION.—We are not without hope. You must not take it that the dental profession has been ignoring this business. They have spent many long hours, as your Chairman has done, on the question of a public dental service. If the local authorities are at all backward in providing such a service, it will not be the fault of the dentists. The former have before them at the present time a scheme which, if they consent to carry it out, will do much for this aspect of national health.

A QUALIFIED PLEA FOR THE TOOTHBRUSH.—In prevention, we have to remember that all that has been said by Dr. Sim Wallace as to proper eating is good, but it does not apply in many cases. It does not apply to myself, for example, and when I conclude my meal with raw salad or an apple, my mouth is not physiologically clean. Why? Because I have an imperfect dental apparatus, and possibly most of us in this room are in the same condition. So do not let us throw away the present means of keeping the mouth comparatively clean. Let us have a toothbrush, notwithstanding what Mr. Holborn said. Let it, however, be properly used. Most dentists nowadays teach their patients how a toothbrush should be used and, if it is properly used, in proper circumstances, it will be an excellent addition to preventive measures. Even Dr. Saleeby need not discharge the little spool of silk. Dental floss silk is an admirable instrument of cleanliness.

PROPAGANDA METHODS.—A last word about propaganda. That is another matter our Dental Committee are taking up

¹ For accounts of dental work carried out by Messrs. Reckitt, of Hull, and Messrs. William Crawford and Son, see pp. 639—642, *Sixth International Dental Congress*, 1914.—Ed.

seriously. I am at present getting together lantern slides for lectures, which may be given in different parts of the country. One slight defect, however, of the British character is that it does not always care to advertise itself, and there has been a feeling that dentists were trying to make work for themselves. The possibility of that should be discounted. We can, moreover, look to a Society such as this to take up the propaganda work and to those agencies mentioned in Mr. Wallis's paper. By the wide dissemination of these views about the bad effects of decayed teeth and the simple manner in which this can be prevented, we may hope that ultimately we shall have the condition we desire.

On behalf of Mr. Doswell Wallis I have to thank you for the attention you have given to his paper and for the evident pleasure you have manifested in having heard it. (Applause.)

AN OMNIBUS RESOLUTION.—Mr. T. C. HORSFALL, Manchester: I have great pleasure in moving:—"That the best thanks of this Conference be given to Sybil, Viscountess Rhondda and to Professor J. George Adami for their presence and addresses, to the Rt. Hon. the Lord Mayor and the Lady Mayoress (Alderman Tom Fox, J.P., and Mrs. Fox), for welcoming the members; to the Public Health Committee of the Manchester Corporation for placing its room at the disposal of the local committee; to the Chairmen of the various sessions; to the contributors of papers; to Dr. Charles H. Preston for organising the Exhibition; to the authorities of the College of Technology for lending their halls for the *Conversazione*, and to Mr. William Eller for arranging the musical programme."

A TREMENDOUS EVIL.—I am sure that we all desire to thank every one to whose exertions we owe the holding of this Conference. I am not exaggerating when I say that I have never before (I am now almost 80) attended a Congress that seemed so urgently needed. Those of us who live in and near large manufacturing towns like Manchester have long known that things were seriously wrong, and during the war evidence of widespread wrongness has been accumulating. I suppose, therefore, that there never was a time when so large a proportion of the community had the intense sense of there being something wrong that they ought to try and set

right. We are asked by this Society to thank a number of ladies and gentlemen who have taken what seems to be exactly the right course for dealing with this tremendous evil.

A LESSON FROM THE BOER WAR.—Let me tell you of some evidence that has been before me for a great many years. In the year before the Boer War, when war seemed quite inevitable and the Government were doing their best to prepare for it by raising troops, of 11,000 young men who offered to enlist in Manchester, 8,000 had to be rejected at once as unfit for any purpose connected with the war. Of the 3,000 not rejected, about 2,000 were only fit for a militia regiment and only about 1,000 were suited for service in the Army. Similar statistics have been forced upon the attention of everybody during the late war. All English men and women have a clear duty before them, of attacking the evils that have given us our C3 population, and a splendid example has been set by those whose names I have read to you.

DEEDS AS WELL AS WORDS.—I notice, however, that this list of people to whom we are asked to express our thanks does not contain the name of Mr. Hecht, the Hon. Secretary, (hear, hear), without whose persistent zeal and devotion to the public welfare I am perfectly sure that this Conference never would have been held. (Hear, hear.) So I take permission to add his name. Let us give our cordial thanks now in words, but let us also try to give more valuable assistance by unceasing work in the future for the purpose of getting removed, or very greatly lessened, the terrible evils to combat which this Congress has been held. (Applause.)

A CAUTION.—MR. T. P. WOLSTON WATT, L.D.S., Senior Works Dentist, Messrs. Cadbury, Bournville: It affords me great pleasure to second the vote of thanks, and I am glad that Mr. Horsfall coupled with it the name of the Hon. Secretary of this Society. Had he not done so, I had fully intended to do so myself.

I have had some little experience in propaganda work, and the conclusion I have come to is that it must be reduced to the simplest terms, since every one has not been studying the question, as most of us have, nor is every one equally intelligent.

Many people when you preach to them about anything, it does not matter whether it is food reform or any other reform, are apt to be a little bit suspicious and think you are getting at them for your own ends. Therefore it is necessary to take up a definite and somewhat narrow line and carry it through. Generalities are not much use to people who want to understand the subject in a concrete form.

A CONCRETE EXAMPLE.—Thus, in this Conference, it has been said that physiologically clean teeth not only do not decay, but cannot spontaneously decay. There must be some lodgment of food particles. We should, therefore, aim at getting people to understand this.

AN ENCOURAGING EXPERIENCE.—We have been trying at Bournville to teach the young people. We give them a lecture illustrated by lantern slides or blackboard drawings, on the structure and care of the teeth, and perhaps next day they are asked to write an essay¹ on it. These essays have proved most interesting and instructive, showing that the majority of the children have grasped the subject quite clearly, though some had not in the least understood what had been said. That is another indication that terms must be reduced to the lowest intelligence of the audience.

The resolution was carried with acclamation.

The CHAIRMAN: The meeting would, I am sure, like to hear a few words from Mr. Hecht.

HONOUR WHERE IT IS DUE.—Mr. CHARLES E. HECHT, Hon. Secretary, in returning thanks: I feel somewhat embarrassed and a little bit out of order by having my name tacked on to the printed resolution. Thank you most warmly for the great honour that you have paid me. A considerable proportion of your gratitude is due to my friends and colleagues, Miss Rita Klein and "The Pudding Lady," Miss Florence Petty, who unfortunately has had to go away this morning. I should also like to take this opportunity of expressing my gratitude for the enthusiastic and loyal support that the local Committee in Manchester have, from the outset, given

¹ School children at the birthplaces of Shakespeare and Sir Philip Sidney (Stratford-on-Avon and Penshurst) have written essays on "Aids to Fitness," a few even blossoming out into poetry.—Ed.

to me. Without such interest, zeal and enthusiasm, it would have been impossible to have carried through the Conference.

PLEA FOR LOCAL CAMPAIGNS.—I do hope that something will be done in the direction suggested in the original invitation, of following up this Conference by having local campaigns in all the chief centres of population. We are only making a start here, as many speakers have emphasised. Such a campaign will be facilitated by the publication, I trust in the autumn, of a report of these proceedings.

CONFERENCE ON RICKETS.—It may be possible in the not distant future to arrange another Conference, say on the urgent and important subject of rickets,¹ perhaps not in Manchester, but certainly in one of the other great provincial towns. Thank you very much indeed.

SATURDAY, MAY 15TH.

CONCLUDING SESSION.

CHARACTER AND THE TEETH.—Chairman, J. LEWIS PATON, M.A., High Master, Manchester Grammar School: Some people are in the habit of judging character by the shape of your head and the conformation of your bumps; some judge of your character by the curve of your eyebrows and whether they meet in the middle or not, some judge of your character by the colour and the curliness of your hair (if you have got any), but I am rather glad that people do not judge of character by your teeth, because, if they did, they would vote us a rotten lot.

ONE OUT OF EIGHTY.—I had over eighty boys in camp one Whit-week and out of that number only one was found to have a good character so far as teeth were concerned, and he was an Indian! It is clear that a Conference is needed; it is high time that we woke people up to the gravity of the situation and the certainty of improvement, if we act on what we know, or ought to know.

A SCHOOLMASTER'S REGRETS.—We used to be told that it was a question of using the toothbrush; if we plied that regularly

¹ Cf. *An Outline of the Practice of Preventive Medicine*, Sir George Newman, K.C.B., M.D., pp. 79-80, and "Rickets and Diet," *National Health*, October 1918.—Ed.

night and morning the teeth would be all right. Now we find that it is food reform that makes the difference between good teeth and bad, and that you have got to eat food which is continually doing the work of a toothbrush. It means giving up a lot of things. It means giving up your porridge. It means giving up hot drinks. Dr. Sim Wallace suggests other drinks, which are alcoholic and should be barred from all civilised consumption. That is not the last word of wisdom, I am sure. It means giving up the best part of a dinner, which is the pudding¹ and potatoes. Well, if it must be, perhaps Mr. Hecht will show us how we are to survive.

EDUCATIONAL METHODS AMONG CHILDREN AND ADULTS.²

By CHARLES E. HECHT, M.A., MANCHESTER, M.C.A.

Hon. Secretary, Food Education Society, late National Food Reform Association.

A GREAT SOCIAL REFORMER.—Mr. CHARLES HECHT: It is a great pleasure to find myself seated under the genial and kindly rule of so eminent an educationist as Mr. Lewis Paton. It is particularly gratifying because I have the privilege, which I regard as a high one, of calling myself one of his revered and distinguished father's (the Rev. Dr. J. B. Paton) "young men." It was my good fortune to work with him for some time and to be able to form some notion of the great services he rendered to this nation.

SCHOOL DENTIST SOCIETY.—May I also express my indebtedness to the School Dentist Society for most kindly allowing me to bring this paper before the Conference? I had the

¹ I am no great advocate of puddings. We in these islands are altogether too fond of pudding. The chief daily meal is held to be incomplete without it. This pultaceous article of diet should not appear on the table more than once or twice in the week.—Dr. Harry Campbell, *Medical Press*, Nov. 24th, 1920. See also *National Health*, February, 1921.—Ed.

² This paper, under the title "Aids to Dental Fitness," was first read before the School Dentists' Society, on December 12th, 1919, and together with the discussion is published in the Society's *Transactions*, vol. vii, No. 28, March, 1920.

privilege of reading it to them in December last and it has been published in their Transactions.

A LAYMAN'S APOLOGY.—As a layman I undertake the duty assigned to me for the first time of facing a professional and, for the most part, an official audience, doing so with considerable diffidence, and only on the assurance of your honorary secretary that my experience, which has certainly been "extensive and peculiar," is likely to prove helpful to your members, more particularly with regard to methods of propaganda, and on the side of prevention. I am encouraged also by the recollection that as a consequence of the prominence given by the Society, which it is my privilege to represent, to the principles of oral hygiene, it was invited by Mr. Peyton Baly (then hon. secretary of Section 9) to send an exhibit to the ill-fated International Dental Congress, held in London during the first week of the Great War.

TEETH IN THE HIGHLANDS.—At an early stage in the history of the "National Food Reform Association," now known as "The Food Education Society," the condition of the teeth question was brought prominently to its notice, and, through it, to the public. Thus, in a passage cited in the first Annual Report, 1909, a member in the far north of Scotland wrote: "In the Highlands the deterioration of physique, even during my own recollection, is so marked as to cause concern to all. When I was a child I remember well what splendid-looking men were to be found everywhere, and especially do I remember their beautiful teeth. Now very few have good teeth, and except on the more distant crofts (where they still keep much to their old food and habits), the men are not superior and in some cases even *less* fine than in towns and in England, while the women are much more affected. Many have lost all their teeth by the time they are 25, or even younger. They drink strong tea five or six times a day (!) and live on white bread and canned meats. Many of them are anæmic, and most suffer from violent indigestion, in spite of coming from such healthy stock and living in the most beautiful air in the world. Their homes and general sanitation are much *improved* from that prevalent in their

parents' time, so that, though I know it is below the English standard, that cannot be the reason." An acute observer, who spent three months last summer in the Highlands, was likewise impressed by the deplorable condition of the teeth.

EXTENT OF DENTAL DISEASE.—In the third Annual Report, 1911, the section headed "The Need for Reform" is largely devoted to the same subject. "Speaking from the chair at its last annual meeting, Dr. Harry Campbell pointed out that the physical evils resulting from ignorance of the laws of dietetics affect the whole nation from the richest to the poorest, and instanced rickets and defective teeth as among the most serious evils of faulty diet. Statistics show that of the children in the United Kingdom only 1 per cent. pass through their first dentition without some diseases of the teeth. There are 100,000,000 bad teeth in the mouths of people in this country, and the same number of 'socket abscesses.' A philanthropist has recently given £200,000 with the object of providing dentists to look after the teeth of the poor people in this country. It would cost more like £200,000,000 in their present condition. If that gentleman had been present at that meeting he would be angry with himself for not leaving the money to this Association. It is better to prevent the trouble than to patch it up."

A WELSH M.O.H.'s DESCRIPTION.—"A Welsh medical officer of health, in a letter which appeared in the *Daily Mail* of March 10th, 1910, thus describes the state of affairs in the Principality: 'The food of the Welsh in these parts up to fifty years ago was of much more strength-giving character than at present, namely, milk, oatmeal as cakes, flummery, etc., barley-meal bread and wholemeal bread with home-made cheese, in conjunction with bacon, beef, and mutton with vegetables. Now the majority take tea four or five times a day, with emasculated wheat bread and butter, foreign cheese, and a little meat and vegetables. The result is that the nation is degenerating physically. On examining school children I found scarcely 2 per cent. with sound teeth, about 10 per cent. requiring spectacles, and a very few with normally developed bone and muscle. Most of the mothers

are dependent on "shop teeth," many are unable to suckle their infants, and most of the youths are cigarette-sucking punies. I consider the laws of the land are much too lax with reference to comestibles.'"

CONDITIONS IN EAST ANGLIA.—"A recent letter gives a no less depressing picture of the state of things in East Anglia. 'The village,' writes a correspondent, 'in which I live is quite exceptionally fortunate in being where there is splendid air, the housing is distinctly above the average, the wages are good, and there is a good supply of milk; but with all these advantages I grieve to say the health of the young people is deplorable. Nearly all of them have lost their teeth by the time they are 21. Our school medical inspector said in his last report: "The better-off the parents and the higher their status, the worse the physical condition of their children and their teeth." I often go round the school to see what the children who remain behind for dinner are having, and it is generally pastry, iced cakes, and bread and jam. I believe the things that are doing the greatest harm to the nation now are sweets, fine bread, and tea. The latter is given to babies from the age of two months.'"

IN THE MIDLANDS.—"In a letter from the Midlands, it is remarked: 'I think that the eating of sweets and cheap biscuits is one of the crying evils of the day amongst children. It is amazing the halfpennies and pennies the parents will give their children to buy the rubbish which ruins their teeth and digestion, and takes away their appetite for wholesome food.'"

INCESSANT EATING AND ILL-HEALTH.—In the fourth Annual Report, 1912, the above-cited East Anglian correspondent writes: "I believe the incessant eating has more to do with ill-health than anything else. I see the children eating on their way to school (after their breakfast), on their way from school going home to their dinner, ditto when they return in the afternoon. I saw a poor little mite of 5 yesterday howling because of toothache. That child has perfectly black teeth, and always has a chunk of bread and jam, and

is fat and white and unwholesome-looking. I think the self-indulgence alone is bad. The bad effect of legislation is shown in the so-called Temperance legislation. People are not really made temperate, but simply abstain from alcohol, and have a perfect orgy in the way of sweets and tea, which I believe are now doing far more harm to the nation than alcohol. We have a great deal of insanity and nerve disease here ; it is chiefly among the teetotallers."

A DENTIST'S SUPPORT.—In the next year (1913) there is a quotation from a member of the dental profession, who is also one of your members, and sits on the Health Committee of the Yorkshire Ladies' Council of Education : " I am deeply interested in, and would like to become a member of, the National Food Reform Association." Subsequent to his enrolment he writes : " I have already lately given two lectures on 'Teeth : their Relation to Health,' and quite half my remarks were in favour of better diet and better cooking."

DIET IN INSTITUTIONS—A MEDICAL CRITICISM.—The following criticism of " Diet in Institutions " from a medical member figures in the Sixth Report, issued shortly after the outbreak of war, from which the succeeding quotations are also taken : " As soon as I took it (a small isolation hospital) over I inquired into the régime of the convalescents as to meal time, diet, and water drinking ; also as to teeth cleaning. I found the usual four instead of three meals a day, drinking with meals (and *tea* to the youngest children), no water drinking between meals, white bread and never brown, almost no fresh vegetables, toothbrushes used only by the bigger children, who are always few." In the same letter he observed : " Many of my patients complain about the diet at — Infirmary. For those on full diet, the régime is as follows :—

Breakfast.—Tea (made in urn, the tea leaves being put in and left in a bag, possibly boiled ; anyhow, the infusion is black and to many undrinkable), and bread and butter, bread always white.

Lunch.—Soup.

Dinner.—Meat and potatoes, soft rice pudding, water to drink.

Tea.—Strong tea, bread (white) and butter.

Supper.—Cocoa or bread (white) and milk.

No water except at dinner time, when amount unlimited.

What is the use of one's preaching correct methods when such an appalling example is set at the big hospitals?¹ Needless to say, all the patients have a terribly strong aperient every other night. The result is that most of them come out with constipation established."

OFFICIAL CORROBORATION.—"In the light of the above," proceeds the Report, "if read in conjunction with the reports of the two Guildhall School Conferences, and that on the Feeding of Nurses, the following extract from a summary of the findings of a special committee, appointed by the Council of Social Welfare for London, on Children's Homes and Orphanages of Greater London, composed largely of the representatives of the great voluntary societies and official representatives of the Board of Trade, Local Government Board, Charity Commission, and Metropolitan Asylums Board, will be read without surprise:—

" 'The diet follows much the same lines in every case, the diet table and the methods of preparation varying but little. Fats, which are so important in the dietary of children, are not given as a rule in sufficient quantity. The children are often too much crowded at table and sometimes insufficient time is allowed for the meal. In almost all homes talking at meals is forbidden. The matrons say that the noise would be too great if the children were allowed to talk, but this rule rather encourages too rapid eating, and digestion must inevitably suffer in consequence. The use of enamel mugs and plates is open to objection, as they are said to be unwholesome and even dangerous when chipped.' "

Several of these passages received a wider publicity through the Press.

¹ Diet in hospitals and other institutions has much to answer for. Its character may be inferred from the remark of a convalescent soldier, who expressed a longing for something he could get his teeth into.—Ed.

PUBLICATIONS.—Unusual attention to problems connected with the selection of the proper food for young children, including mastication, upon which special emphasis is laid, is given by Dr. W. A. Potts, of Birmingham, in *The Feeding of Young Children*, 3d., of which several editions have been republished by the Society. In recent years many copies of Dr. Truby King's *Feeding and Care of Baby*, 2s., and *The Story of the Teeth*, 1s., have also been disposed of.

THE STORY-TELLING MODELS.—At the Children's Welfare Exhibitions, held at Olympia in 1913 and 1914, two models of children's teeth—as they are, and as they might be—occupied a prominent position on our stall and aroused much interest among both children and their elders. The one represented the teeth of a boy of 10, described by Dr. Harry Campbell at one of our annual meetings as the most perfect he had ever seen, though the lad had never used a toothbrush. He had, however, the advantage of having been brought up on principles associated with the name of Dr. Sim Wallace. A quotation from Sir George Newman, exhibited alongside, suggested that what mattered most was the nature of the foods and the habits of the individual. The other model represented a girl of about the same age, and was said to be typical of children of either sex, whether a toothbrush were employed or not. The text of both notices is given in *Rearing an Imperial Race*, 8s. 6d., p. 303. (The two models will be found on the table.)

A detailed account of my experiences at the Exhibition appeared in *National Health* for February, 1913,¹ and lent support generally to the above-mentioned view. Indeed, on my describing to a well-known member of your Society certain cases in which laws of oral hygiene had apparently been transgressed with impunity, he remarked: "I had a patient this morning who was suffering from too much toothbrush."

CONFERENCE OF HOSPITAL MATRONS.—In 1910 the Caxton Hall Conference of Hospital Matrons on the Feeding of Nurses was convened by us, and with the aid of the published Report, 6d., has led to improvements in many hospitals.

¹ Reprinted on p. 148.

This is notably the case in the matter of the time allowed for meals, which came in for considerable criticism.

HINTS FOR HOUSEKEEPERS.—The following appear among the "Supplementary Suggestions for Securing Greater Variety in Diet and Raising the Standard of Health," prepared at the request of the organising committee of Matrons of the Conference :—

"Puddings and porridge should be as compact as possible, so as to encourage mastication.

"Hard biscuits, or crisped bread, might be on the table at all meals, and their use, instead of bread, encouraged. (See Booklet 2, 2d., Notes 4 and 7.)

"Eating at the mid-morning meal and at afternoon tea¹ should be reduced to a minimum. (Cakes, scones, etc., served at the latter meal, might be obtainable at the evening meal instead.)

"As alternatives to white bread, brown bread made from wholemeal flour finely ground and thoroughly cleansed, or old-fashioned cream-coloured household bread, containing about 80 per cent. of the grain, including the germ and the semolina, should be provided.

"Proper intervals should be allowed between meals."

In the lectures to nurses it is suggested :—

"(a) More stress might be laid on food values.

"(b) Attention might be drawn to the effect of diet and mastication on the teeth, digestion, health, and endurance.

"(c) Excessive drinking at meals, or immediately before or after, might be discouraged.

"(d) Eating between meals, or immediately after severe exertion, might be deprecated.

¹ Afternoon tea is the most dangerous meal from the dental point of view. Tea and bread and butter prevent, rather than promote, a free flow of saliva—essential for the preservation of the teeth. For this reason, bread and orange sandwiches are to be recommended and all meals should be as tasty as possible. People ate too much starchy food, bread in particular, and this led to fermentation and the formation of lactic acid, which attacked the crevices in the teeth. A fair allowance of fruit and vegetables—uncooked—and taken at the end of a meal for preference, should be included. They had a most beneficial effect in preventing fermentation.—Sir Harry Baldwin, Surgeon-Dentist to the King, November 8th, 1920.—Ed.

"(e) Immoderate use of condiments, pickles, sugar, etc., might be discouraged. (See Booklet 2, Note 11.)"

GUILDHALL SCHOOL CONFERENCES.—In 1912 the first Guildhall School Conference on Diet and Hygiene was called by our Society. All secondary schools, both public and private, day and boarding, came within its scope. The papers read included one by Dr. Sim Wallace on "The Main Lines of Reform." (See *Our Children's Health at Home and at School*, pp. 88-96. 5s.)

The subject of mouth hygiene also received considerable attention at the next year's Conference, e.g., under such heads as Malnutrition, Anæmia, Porridge, Sugar, Children's Diet, and in a section entitled "How to Save the Teeth." (See *Rearing an Imperial Race*, pp. 293-306. 8s. 6d.) Diet, cookery, and hygiene were here dealt with from the point of view of primary schools and the homes whence the children were drawn. The indirect influence of the views enunciated at the Guildhall on both occasions may possibly be traced in the advice given by the Board of Education in a Memorandum issued in the early days of the war, on meals for undernourished scholars.

DIETARIES, ETC.—The three Reports mentioned above have been supplemented by *The Feeding of Children*, reprinted from *The Child*, 3d., and quite recently (1919) by *Dietaries for Secondary Schools, Colleges, Hostels, Clubs, etc.*, by Miss Dorothy Moore, a valued member of our lecturing staff, in collaboration with me, 1s. 3d. The notes contain advice on the lines given here.

GENESIS OF "AIDS TO FITNESS."—In interviews and comments on the first Conference, which excited widespread interest among Press and public, discussions of the "tuck-box" and "tuck-shop" naturally figured prominently. The following extract from the letter of a distinguished educationist, wife of a house master at a public school, Mrs. H. H. House, of Malvern College, appears with others in the Report, and contains the genesis of the sheet *Aids to Fitness*. 1d.

May 10th (three days before the Conference).

"It has occurred to me that it would help the housekeeper considerably if, after the Conference, a short summary of

its conclusions could be drawn up and printed in a suitable form for posting on a house notice-board, in order that the boys might see for themselves what is being aimed at and could collaborate. One can then place certain possibilities in the way of food within their reach and leave it to the individual to use his discretion. I am quite sure that the average boy is keen to do the best for himself and his house, both at work and games, and all that he wants is teaching. I think he would even avoid the 'tuck-shop' if he knew positively that *people whose authority he respected* regarded it with suspicion. But because he is brought up to think that a fellow should eat what he likes, he does it."

WHAT THE BOYS SAID.—Early and favourable consideration was promised. Accordingly, as soon as the Report was issued, I tried my hand at a leaflet on the lines suggested. Being anxious, however, that it should be thoroughly practical and helpful, I asked my correspondent to secure candid opinions from the boys, among whom she had "started reform by introducing," within a couple of days of the Conference, "crusts and baked bread as a preliminary." "I have shown your draft," she writes, "to our matron and the two head prefects. The boys at first were up in arms about it (tuck-boxes), but when the matron had shown them both that they had never had the sort of tuck that we wished to condemn and pointed out what she has to do in the way of curing the evil produced by the little fellows' tuck-boxes, they saw what we were driving at. . . . One of the boys was last year's champion athlete, and the other was one of the 'runners-up,' so that they both know what training is, and said at once, on the point of not drinking at meals: 'That's what we do in training.' So I rubbed it into them that what they were willing to do to win races, they might regard as useful for general purposes."

Writing a year or two later, my correspondent remarked: "It may interest you to know that the winner in the house sports yesterday was also the slowest eater. This is as it should be."

AN AUTHORITATIVE SHEET.—Fortified by such convincing testimony to the "sweet reasonableness" and logic of the sheet, it was then submitted to the Schools Committee,

which included representatives of the British Medical Association and British Dental Association in the persons of Dr. Robert Hutchison, author of the standard work on food, and Dr. J. Sim Wallace, respectively. The Head Masters' Conference, the Association of Head Mistresses, the Incorporated Association of Head Masters, the Private Schools Association, with other school and parents' organisations, such as the Parents' National Education Union and Child Study Society, were also represented on it. Authority to issue the sheet, as well as help in making it known, was freely given.

A FRIENDLY RECEPTION.—It was accepted by Her Majesty Queen Mary, with her "warm thanks," and met with a friendly, though not uncritical, reception in the Press. The *Standard* deserves honourable mention for the prominence given by it. Among others, the *Daily News*, *Daily Express*, *Daily Telegraph*, *Lancet*, *Queen*, and *Schoolmistress* may be named.

Professor Irving Fisher, the distinguished economist and perhaps the first authority on health in the United States, wrote: "I was greatly interested to see this and think it ought to do much good. The mouth is the gateway to health." The late Mr. Horace Fletcher, who, like Professor Irving Fisher, was one of our Vice-Presidents, obtained a supply of the leaflet, in which his achievements figure prominently. It gradually found a place on many school notice boards. Thus, a famous Scottish public school ordered fifty copies, presumably for its dormitories, while one of the largest English girls' schools had one hundred. The West Hartlepool Education Committee were apparently sufficiently impressed by its usefulness to order a similar number. Effect will, however, I hope be given at an early date to a recent suggestion of your enthusiastic hon. secretary,¹ by bringing out in larger type a modified edition, more suitable for primary schools and for parents. This could also be posted in continuation schools, clubs for children and adolescents, in the waiting rooms of clinics, infant welfare centres and schools for mothers, and last, but not least, of private practitioners.

¹ Mr. William Fisk, now President E.A.

VERSION FOR "GROWN-UPS."—Many school children were among its purchasers at Olympia and elsewhere, and several editions have been called for. The sheet, moreover, found such favour with "grown-ups" that it had to be issued in ordinary leaflet size.

TALKS TO SCHOOL CHILDREN.—During the years 1915 to 1918 five-minute talks, illustrated by the models described above and by photographs in Dr. Truby King's book on *The Story of the Boy With the Ripping Teeth and the Girl With the Rotten Ones*, were given to classes of thousands of school children, chiefly drawn from the primary schools, at economy and welfare exhibitions in London, East and West, Manchester, Liverpool, Bangor (N. Wales), Bournemouth, Gloucester, Exeter, and Stratford-on-Avon. Longer, though equally informal, addresses were given to many adult audiences throughout the country. Needless to say, children were not advised to dispense with the toothbrush, but rather to have two strings to their bow. They were told, however, that the girl with the "rotten" teeth might quite possibly have used a toothbrush diligently, but if she neglected to exercise her jaws and teeth or ate improper food, it would not have availed her.

EXPERIENCES AT MANCHESTER.—*National Health*, for December, 1916, contains some particulars of experiences at Manchester which may be found suggestive:—

"An interesting and instructive feature was the replies received to the query as to what, in their judgment, accounted for the 'ripping' teeth of the boy, as distinct from the 'rotten' ones of the girl. The usual answer was that the teeth had been looked after or cleaned, though not infrequently it was suggested that the kind of food eaten was responsible for the difference. After some days, a more novel and highly controversial theory was advanced by the girls belonging to three Salford schools. (For some unstated reason, girls alone were brought to this (Manchester) Exhibition.) A girl of the first class said: 'Boys don't eat so many sweets as girls.' In the next batch there came a slight variation on the same theme: 'The boy did not eat so many twopennies.' With a third it was: 'Boys do not eat so much toffee.' 'Grown-ups' who were sounded

appeared indisposed to accept the above view, as illuminating as it was original. It recurred, however, among the replies of Manchester schoolgirls. On the last evening of the Exhibition gratifying testimony was received to the impression that had been made about a subject which as one teacher remarked, 'ought to be taught in every school.' A teacher at a Domestic Economy Centre came expressly to see the models, of which her pupils, drawn from some half-dozen Manchester schools, had told her. She had inquired what at the Exhibition had interested them most. Often the reply was : 'The story of the "ripping" and the "rotten" teeth.' They proceeded to tell her how it came about that the boy had the best teeth, and initiated her into the mysteries of 'scrunch,' which she likewise wished to see for herself."

A VALUABLE EXPERIMENT.—See also "A New Form of Food Saving," a letter appearing in the *Manchester Guardian*, September 8th, 1917, and that there referred to from Mr. G. P. Holden, ex-chairman, Darwen Public Health Committee, describing his valuable experiment in the schools. Mr. Holden writes : "Your big leaflet is word for word what I have been teaching here."

"ODES TO SCRUNCH."—A talk at a girls' secondary school on the South Coast in 1915 had an interesting sequel. Instead of the weekly composition, the head mistresses set two forms, a senior and a junior, the task of writing "Odes to Scrunch." For the information of the uninitiated it may be explained that "scrunch" is a species of toasted bread warranted to compel mastication. A sample figured on our stall at every exhibition, and will be found here. The subject was, evidently, relatively popular, one of the girls informing me in confidence that it was the first composition of the term over which no girl had groaned ! It also disclosed unsuspected evidence of poetic talent, notably in the case of a couple of limericks by twin sisters, aged twelve or thereabouts. A selection from these poems has since served as the jam to sweeten many a pill, and has been greeted with enthusiasm, not only by other school children, but also by "grown-ups." They were quoted at a Lyceum Club dinner in 1917 on "Ideas for the Food Controller," at which my subject was,

by request, "Aids to Fitness." There is a lengthy waiting list of schools anxious for a similar talk from "Mr. Scrunch," as I have been dubbed.

(At this stage some of the odes were read.)

At Stratford-on-Avon some of the school children and pupil teachers, visiting the Exhibition, were set to write essays upon the talks which they had heard. Two of them went so far as to attempt parodies, on the strength of a hasty reading to them, of the odes! Their efforts were published in a London paper as well as in the local press.

A STARTLING RUMOUR.—On one occasion the description of me by a head mistress as a "food expert" had somewhat embarrassing consequences. A rumour spread through the school and even, with the aid of the maids, penetrated into the village, that I had been sent down by the Government to see that the school and, indeed, the whole community did not eat too much! My week-end had been spent at the school and meals taken with the children, so the position appeared serious. Criticism, however, was disarmed at the outset of my address by a repudiation of the base insinuation.

A "CHUCK-TUCK" LEAGUE.—The boys' school which is singled out for mention in *Aids to Fitness* achieved even more than it is there given credit for, since the senior boys "of one house" should really have been "of the whole school." During the war it went one better by forming "Chuck-Tuck" and "Anti-Tuck" Leagues. A full account of this notable contribution to individual, household, and national economy was given by me in the *Times Educational Supplement* for December 6th, 1917.

LECTURES ON THE TEETH.—Our lecturing staff, which includes "The Pudding Lady," Miss Florence Petty, gave prominence throughout the war, both in cookery demonstrations and lectures, to the subject of mastication and of food in relation to the teeth. Recently a number of lectures on "The Care of the Teeth" have, by request, been given to women's institutes by Miss Petty and by Miss Dorothy Moore.

KEYNOTE OF "AIDS TO FITNESS."—The keynote of the teaching of *Aids to Fitness* is that it matters as much, if not more,

how and *when* we eat and drink as *what* we eat and drink. In this contention I am confident of having the support of a profession compelled to do a great deal in the way of treatment which observance of rules like these would render superfluous.

Children believe exercise to be natural and good, and so they are reminded at the outset that their teeth and jaws are not exceptions to the rule.

DEFECTS OF PRESENT-DAY DIET.—Stress is laid upon the evils resulting from the improper use of starchy and sugary food. It is relatively a less heinous offence from the point of view, anyhow, of oral hygiene, to bolt one's meat or fish than to bolt one's starch. In the first instance, Nature affords other opportunities of rectifying sins of omission; in the case of saccharine (starch and the sugars) the harm done is irreparable, since the food must be prepared for digestion in the mouth. Thus, the large part played by such dishes as bread and milk, mashed potatoes, mince, milk puddings, porridge, blanc mange, custard, junket, as well as by bread and butter, sandwiches, cakes, and buns, in the diet alike of children and adults, is open to grave objection on this score. The ill-effects are aggravated by so much food being served in a soft and sloppy form. The diet, moreover, of all classes is excessive so far as starchy and sugary food is concerned.

SUGAR AND SWEETS.—“ Cheap tea and sugar,” remarked the *British Medical Journal*, in a leading article as far back as February 12th, 1910, “ have done disservice to our people.” Accordingly, Dr. Sim Wallace said no more than the truth when, early in the war, he insisted that every penny spent on sugar and sweets was money wasted. Think for a moment what a reproach such a statement implies. There are, however, far too many who openly or secretly sympathise with the little boy who, when told that he could, by thorough mastication, produce all the sugar that he required in his own mouth, exclaimed: “ I wish I could get it out ! ”

Apart from the physiological argument, the conclusive answer to the champions of sugar is that, until a few generations ago, it was unobtainable except in an apothecary's shop. Children have a natural liking or desire, not for sugar

and sweets, as so many of their elders would have us believe, but for such things as fruit, fresh and dried, honey, raw vegetables and salads.

MORE LIGHT ON THE SUBJECT.—Those desiring fuller information are referred to *Facts for Patriots*, second and third series, 4d. each. These contain articles on meat, fish, milk and the milk supply, vegetables, fruit, salads and sweets, bread and flour, and deal with their food values, digestibility, the best way of using, etc.. *Why Worry About Sugar?* and *The Sugar Habit*, 1d., *The Importance of Fat in Diet*, 1d., and *Diet for Brain Workers*, 1d., should also be consulted. In the first-mentioned leaflet I had the unexpected advantage of the support of a member of your profession.

MERITS OF "SCRUNCH."—Negative advice, however, is all very well. If our habits are to be reformed, positive suggestions and far more drastic methods are called for. Food should, so far as possible, be served in a form compelling or, anyhow, encouraging mastication. Where this is not possible crusts, biscuits, rusks, or last, but not least, *thin* slices of stale bread dried, preferably in a slow oven, should be introduced as an adjunct of the meal. Such "scrunch," also known as "fairy" or "angel" bread, while schoolboys have dubbed it "crusk," has won widespread popularity and revolutionised the health of thousands. Not least among its merits is the fact that it finds favour in quarters where crusts are unwelcome. "It leaves such a nice taste in one's mouth," remarked a Malvern boy. "It would delight you to know," writes a head mistress, "how thoroughly we have adopted 'scrunch.'" "Of all the lands I have visited," says Rabindranath Tagore, the great Indian poet, "the United States is the only one where the person eats the inside of a slice of bread and throws away the crust." I fear the remark is equally applicable to many homes here.

HORACE FLETCHER ON RATIONS.—At the same time "scrunch," if prepared as directed, is of so brittle a consistency as to offer no obstacle either to the child engaged in the process of changing its teeth, or to the adult inadequately supplied. Incidentally it may be remarked, as was pointed out in talks during the war, that the practice of mastication makes not

only for efficiency, but also for economy, since the same amount of nourishment is obtained from a less amount of food. Horace Fletcher, one of Mr. Hoover's associates in Belgium, wrote to a friend in London a couple of years ago: "I have no worry about actual starvation in England, and I believe there will only be such shortage of food material as will be good for the people in teaching them lessons of practical value. We have learnt in Belgium that when there is a restricted ration the users of the ration, quite naturally, eat it carefully and completely. It is only in the presence of a plethora of supply and of aggressive or tempting hospitality, that systematic Fletcherising is necessary to limit the intake to the real body needs of the moment." Nansen, it is said, found that when his men were on half-rations, taking twice the time for a meal, they were in better form.

FLETCHERISM BY ORDER.—A Reuter's telegram, October 25th, 1916, from Copenhagen, stated that "the workmen, sailors, and marines employed at the Imperial shipyards at Wilhelms-haven recently received from the authorities copies of a book by an American, named Horace Fletcher, entitled, *How to Live on a Minimum Quantity of Food by Thorough Mastication*, accompanied by a pamphlet by a military doctor, imploring everybody to Fletcherise, namely, to chew food over and over again and thus save enormous quantities daily. It is added that officially appointed demonstrators are to be provided to show the men at each meal how a little can be made to go a long way."

According to a leaderette in the *Manchester Guardian* (November 20th, 1916), an entertaining controversy subsequently arose between the champions of chewing, represented by Professor Kersting, of Aix-la-Chapelle, and Professor Cohnheim. The latter advocated bolting one's food with as little mastication as possible, the object apparently being to achieve indigestion!

MASTICATION AND THE BRAIN.—Mastication is also essential, as Dr. Harry Campbell has pointed out, to the proper development of the cranial bones, and thus possibly of certain portions of the brain.

GLADSTONE VERSUS FLETCHER.—As to methods, my preference is always expressed for the plan advocated by Mr. Horace Fletcher of seeking to retain the taste of the food as long as possible, as against Gladstone's alternative method of

“Thirty-three chews to each mouthful he took
To prepare for the pleasures of age.”

The latter was all very well for a Chancellor of the Exchequer who lisped in figures, but presents obvious difficulties to the ordinary mortal. It is also less pleasant.

HOW TO END A MEAL.—Another matter upon which emphasis is laid is the correct ending of a meal. The conventional way of closing so many repasts with bread and marmalade, bread and jam, bread and treacle, or bread and honey, are criticised as sinning conspicuously against the injunction that the mouth should be left physiologically clean at the close. This result may be obtained by the use of a crust, hard biscuit, “scrunch,” a raw apple, orange, lettuce, cress, radish, celery, carrot, turnip, onion, etc.

Stress is placed on the peculiar perils which indulgence in starchy or sugary food last thing at night involves.

EATING AND DRINKING.—Meals at too frequent intervals are also deprecated. Again, it is recommended that the processes of eating and drinking should not be simultaneously performed. A doctor suggested, a few years ago, to a meeting of the British Medical Association at Brighton, that failure to observe this rule was responsible for much indigestion and nerve trouble. The only animal, he declared, that drank with meals was a pig. (See *Rearing an Imperial Race*, p. 70, footnote.) I quoted this with effect, until one day a distinguished agriculturist informed me that he was experimenting with his prize pigs by putting them on a dry diet!

A NATIONAL FAILING.—While, however, adults drink too much at meals, and thus interfere with Nature's beneficent processes, they do not drink nearly enough apart from meals, and notably the first and last thing. Children, in particular, owing to their active habits, require, like animals, a large amount of liquid, especially in hot weather, and this should always be available.

Excessive indulgence in condiments and sugar is condemned as prejudicial to health, if it be not a mode of disguising bad cooking!

For further details I must refer you to the sheet itself.

After what has been said, it will seem somewhat in the natural order of things for our Society to extend its campaign on "the most urgent matter before the Nation" as a medical member in a recent letter describes it. It has the advantage of enjoying the confidence, on the one hand, of the medical and dental experts and of educationists and social workers, without whose co-operation reform cannot be carried through, on the other.

(Here followed a reference to the Conference.)

In view, however, of the long and terrible catalogue of woes, justly ascribed to the neglect of teeth trouble, by Mr. Montagu Hopson, L.D.S., R.C.S., Eng., in his Presidential Address of August last to the British Dental Association, it would be presumptuous for a mere layman, who has already trespassed too long on the indulgence and patience of experts, to say more.

The CHAIRMAN: Mr. Holden, late Chairman of the Darwen Public Health Committee, will now speak to us.

DO WE EAT TOO MUCH?—Councillor G. PICKUP HOLDEN, Vice-Chairman, Public Health Committee, Darwen Town Council: I would like, at the request of the Food Education Society,¹ to give you briefly the practical results of the experiments that we undertook in the Elementary Schools of Darwen, in the middle of the late war. At that time we were faced with a serious difficulty in regard to the food supply, particularly with respect to bread. I found one man living not merely upon 50 per cent. less of bread, but 50 per cent. less food than the average man, yet gaining remarkably in strength. He was a young man who had been suffering from kidney trouble, which he had entirely thrown off. Another, who had been given up by a specialist, had gained in health and strength, though he also had considerably reduced his quantity of food. The system of feeding of these two men was largely based upon careful diet. Horace Fletcher

¹ Mr. Holden did not see his way to accept the invitation to contribute a paper. His experience is, however, too valuable to be lost, see pp. 134-142.—Ed.

found that his tests had been carried out by thousands of Venetian troops and that they had been able to live on 20 to 30 per cent. less food, give off greater energy, and yet retain their strength.

A NOTABLE EXPERIMENT.—We began with a general conference of the teachers, some 200. The teaching of complete mastication, to ensure complete nutrition, giving greater efficiency and with less waste, was given special prominence on account of the urgent need for food economy—*Eat less bread!*

FEHLING'S TEST.—Experiments prove by Fehling's test for grape-sugar that bread is converted into grape-sugar by the addition of saliva, and that bread (starch) to which saliva has not been added—remains in its original condition of starch—is not converted into grape-sugar, from which the body receives its nutrition. The effect of non-mastication, or of washing down foods by liquids (tea especially), is to place increased strain upon the digestive organs and involves waste in the use of starchy foods.

In order to show this experiment and its results, small test tubes of starch were (in the presence of the school children, the experiment being carried out by themselves) tested for grape-sugar by Fehling's test. Those test tubes, containing starch and water only, showed a blue transparent solution, the starch remaining as starch—indigestible—non-nutritious. The other test tubes, containing an equal amount of starch and water after the addition of saliva, showed by the same test the change effected. The blue transparent solution is changed into an opaque ruddy-coloured mixture and chemical analyses prove this to be grape-sugar, digestible—nutritious.

FAULTY DIETETIC HABITS.—The Lancashire operatives, like the workers in other industrial centres, have the habit of washing down their food; and especially dry starchy food (bread, etc.), by the addition of tea, thus enabling food to be quickly swallowed. This process has two injurious effects. The teeth are permanently injured, as proved by recruiting statistics; the enormous number of men rejected for bad teeth is well known and there is a loss of strength and stature due to defective nutrition.

After this preliminary exhibition of the testing of increased mastication, to prove increased nutrition possible, although a

lessened quantity of food was consumed, the lesson was given throughout the elementary schools of the town to about 6,000 children. In order to make the lessons practical, bread was provided and cut in small cubes: We had about 30,000 meals a week. It cost practically nothing—£15—as each had so small a quantity.

RESULTS.—Both teachers and scholars were greatly interested, and enquiries made from various working-class homes in the district proved that a lessened consumption of bread was effected by increased care in mastication.

Medical testimony to the efficacy of complete mastication supports the proposal to teach this important branch of physiological education. I hope that it may be made a more prominent feature in the curriculum of the schools.

BACK TO FLETCHERISM.—Those of you who wish to study the question more fully would do well to get back to Fletcherism. Fletcher, at the age of 40 years, was given up as an uninsurable life—and you know that an American Insurance Company does not like losing business. That was a striking testimony to his unfitness. He then endeavoured to resuscitate his health and, by attention to diet and mastication, succeeded in making himself one of the strongest athletes of his day and generation. At the time that he made certain tests of strength, Fletcher said that his food was costing him sixpence a day. The method of a man who, from being a broken invalid, can successfully, without training, double the test of strength of any other man in the world, is worth following.

With a prospect of famine, I thought that it was my duty to my town to start an educational campaign. I further endeavoured with some success to induce the London County Council to carry out the same plan. This Conference has proved the need for such a campaign, not merely for the saving of food but for the saving of life.

A DENTIST'S TESTIMONY.—MR. ROBERT LINDSAY, Dental Secretary, British Dental Association: The work of Fletcher has been well known among dentists for a long time, and some of us have been enthusiastic in helping to carry it out. One obstacle to the success of Fletcherism is the social element, as depicted in *Punch*. That perhaps may be a reason why it has failed to command general acceptance. I can, however,

testify from personal experience that we eat far too much food and that the greater part is never digested. If we limit ourselves to the proper quantity, thoroughly masticated, undoubtedly we shall benefit, not only in our purses, but in our health. In Fletcher we have a remarkable instance of this. I am surprised that my friend Dr. Sim Wallace did not bring forward this illustration in his advocacy of mastication.

The CHAIRMAN : There is nothing really to reply to, but Mr. Hecht is so full of information that is material on this question that I am going to ask him to give us five minutes, anyhow.

Mr. HECHT then read a few additional passages from his paper.

The CHAIRMAN : That brings us to the end of the Conference.

(C) COMMENT AND SUPPLEMENT

THE EXHIBITION.

[The Conference, unfortunately, coincided with a period of far-reaching reorganisation in the dental politics of Manchester. As a result, the leaders of the profession, with the best will in the world, found their scanty leisure during the months immediately preceding heavily mortgaged. All the more is acknowledgment due of the public spirit and zeal with which Dr. C. H. Preston, Curator of the Manchester Dental Hospital Museum, at the eleventh hour, consented, at the instance of its Dean and a member of the local Executive Committee, Mr. Hilditch Mathews, to step into the breach and to provide a small exhibition. This admirably illustrated the main problems discussed at the Conference.

Thanks are also due to Mrs. Mellanby and Mr. Pitts for their illuminating contributions.

It was originally suggested that the exhibition should be permanent in character and available in connection with local campaigns throughout the country. The shortness of time and the fact that the exhibits were loaned made it impossible to give effect to this portion of the scheme. It is hoped, however, that, with the aid of the appended details, no difficulty will be experienced in arranging one on similar lines.—Ed.]

The Exhibit described below was arranged by Dr. C. H. Preston, Curator of the Manchester Dental Hospital Museum.

1. A series of specimens of the developing jaws and teeth at different stages, to illustrate the argument that soft pultaceous food should not for too long form the staple of the diet, but that as soon as teeth capable of mastication are in place, the food should be presented in a form which requires efficient mastication.
2. Specimens of temporary and permanent dentitions, practically perfect, both in freedom from decay and in the arrangement of the teeth.
3. An Egyptian skull from the excavations by Professor Flinders Petrie, showing great wearing down of the teeth by a hard rough diet; but also excellent form of the dental arches, and freedom of the teeth from decay. These conditions are very general in ancient skulls.
4. A specimen showing the effect of exercise in promoting the growth of the bone. A lower jaw of strong type, with spines of bone projecting from the angle into the insertion of the Masseter muscle.
5. *Hypoplasia*.—A series of teeth, not decayed but defectively formed, owing to infantile diseases affecting the germs of the forming teeth. Some of these diseases are caused by faulty diet.
6. *Pyorrhæa*.—Specimens showing the destruction of the sockets of the teeth by this disease, resulting in the loss of many sound teeth and the displacement in position of those that remain.
7. Specimens showing the deformities of the teeth due to hereditary syphilis.
8. Enlarged models of the teeth in health and disease—suitable for popular instruction.

Models exhibited by Mr. A. T. Pitts, showing:—

1. Different stages of attrition of the teeth in children.
2. Defective development of the temporary teeth caused by congenital syphilis.
3. Deformities of the jaws caused by thumb-sucking and other habits.

Demonstration Specimens illustrating the following points were shown by Mrs. Mellanby.

1. Poor and abnormal growth of the jaws and alveolar processes.

2. Teeth irregularly arranged.
3. A delay in the eruption of the dentition and a delay in the shedding of the deciduous teeth.
4. Defective enamel.
5. Defective dentine showing numbers of interglobular spaces.
6. That the greater the rate of growth of the animal, the greater the jaw and teeth defects produced by the absence of Fat Soluble A.

SUGGESTIONS FOR LOCAL CAMPAIGNS.

Exhibition—modelled on that described on page 336.
Bookstall.

Informal addresses, illustrated by models, at exhibition or schools, to :—

1. School children.
 2. Girl Guides and Boy Scouts.
 3. Members of Girls' and Lads' Clubs.
 4. Schools for Mothers, Infant Welfare Centres, Mothers' Meetings, etc.
 5. Factories, works, large shops.
- Essays to be written.
Popular lectures with lantern illustrations.
A film at the Cinemas.
Visits to places of interest.

CONVERSAZIONE.

[Those attending conferences frequently attach to opportunities for meeting socially their fellow-workers a value scarcely, if at all, inferior to the actual proceedings. The gathering at the Manchester College of Technology suffered, to some extent, through being held on the evening of the second day, when many members had already been compelled to leave. It was a matter also of great regret to those remaining that, owing to a command to attend at Buckingham Palace, the Lord Mayor and the Lady Mayoress, Alderman Tom Fox and Mrs. Fox, were unable to extend an official welcome to the guests, as they had looked forward to doing. Warm thanks are due to Alderman Sir Charles and Lady Behrens, a popular ex-Lord Mayor and Lady Mayoress, who, at the request of the Chief Magistrate, consented, at twenty-four hours' notice, to take their places.

Those present also owed a special debt of gratitude to Mr. William Eller, Hon. Director of the Manchester Tuesday Noon Concerts, for the delightful musical programme, worthy of the city's reputation as the most musical in England, with which, despite the scantiest warning, the guests were regaled.

The proceedings, apart from the reception and a brief address of welcome from the Lord Mayor's representative, were informal in character. The setting of the scene in the palatial halls, with their noble statuary and the sprinkling of academic costumes, added to its attractiveness.—Ed.]

MEMBERS OF THE CONFERENCE.

Colonel J. G. ADAMI, F.R.S., M.A., M.D., Vice-Chancellor, University of Liverpool.

Miss JOSEPHINE ALLEN, Cookery Mistress, Norwich Education Committee.

Miss WINIFRED ANDREW, Secretary, Manchester and Salford District Nursing Institution.

Mrs. HERBERT ASHBURNER, M.A., Hon. Secretary, Manchester Ladies' Public Health Society and Salford Mothers' Guild.

Councillor MARGARET ASHTON, M.A., Manchester City Council.

PERCY ASHTON, L.D.S., Senior School Dentist, Leicestershire County Council, Leicester.

J. H. BADCOCK, L.D.S., M.R.C.S., L.R.C.P., London.

Alderman BARKER, J.P., Vice-Chairman, Henshaw's Blind Asylum, Manchester.

WILLIAM BATES, L.D.S., School Dentist, Macclesfield Education Committee.

Miss MARY S. BEARD.

H. BECKETT-OVERY, M.D., F.R.C.S., Chairman Food Education Society, London.

Mrs. WALTER BEER, Hon. Secretary, Manchester and Salford District Girls' Club Union.

Captain HARRY BROUGHTON, L.D.S., School Dentist.

T. BROWN, Manchester Teachers' Association.

Miss GWENDOLEN BRUCE, Physical Training Instructress, Lecturer in Education and Warden of Ward Hall.

HARRY CAMPBELL, M.D., F.R.C.P., Vice-Chairman, Food Education Society, London.

GEORGE G. CAMPION, L.D.S.

MEMBERS

339

- Miss CATHERINE CHISHOLM, M.D., Medical Inspector, Manchester High School for Girls.
- Mrs. MARION COCKERELL, M.B., Medical Officer, Argyle Square, King's Cross, Infant Welfare Centre.
- E. CLAYTON COOPER, L.D.S., Hon. Secretary, Central Counties Branch, British Dental Association, Birmingham.
- Miss R. E. S. COX, Member Royal British Nurses' Association.
- RALPH CROWLEY, M.D., Medical Inspector, Board of Education, London.
- Mrs. J. L. CUNLIFFE, Hon. Secretary, Sale Infant Welfare Centre.
- CHARLES B. DALBY, L.D.S.
- J. HOLLIS DENNIS, L.D.S., Messrs. Tootal Broadhurst, Lee, Ltd., Bolton, Dental Clinic.
- HERBERT DIXON, L.D.S.
- W. P. EWING, Secretary, Manchester Teachers' Association.
- Miss MARION FITZ GERALD.
- GEORGE GILL, Chairman, Manchester Crippled Children's Help Society.
- Mrs. E. GLAZIER.
- Miss GLAZIER.
- Nurse C. GRANT, Farnworth District Nursing Association.
- FRED HARGREAVES, Hon. Secretary, Manchester Crippled Children's Help Society.
- J. B. HARTLEY, L.D.S.
- DAVID HEADRIDGE, L.D.S., Chairman, Manchester Dental Hospital Committee.
- Councillor CAROLINE HERFORD, J.P., Manchester City Council.
- CHARLES E. HECHT, M.A., M.C.A., Hon. Secretary, Food Education Society.
- Mrs. HODKINSON, Bolton School for Mothers.
- F. MAURICE HOLBORN, L.D.S., London.
- G. P. HOLDEN, Vice-Chairman, Darwen Public Health Committee.
- T. C. HORSFALL, Macclesfield.
- EDWIN HOUGHTON, L.D.S., President, E. Lancs. and E. Cheshire Branch, British Dental Association.
- W. H. ILLINGWORTH, Superintendent, Henshaw's Blind Asylum, Manchester.
- Miss LANDEL JONES, Superintendent, Argyle Square, King's Cross, Infant Welfare Centre.

WILLIAM H. JONES, M.A., L.D.S., Dental Officer, Staffordshire, late Cambridge Borough Dentist.

S. M. KROPAN, L.D.S., late Senior House Surgeon, Manchester Dental Hospital.

Miss MAY LENNARD.

Miss M. K. LEA, Liverpool.

Nurse E. LEYLAND, Farnworth District Nursing Association.

ROBERT LINDSAY, L.D.S., Dental Secretary, British Dental Association, London.

T. LOMAX.

F. MACKENZIE, L.D.S.

J. HILDITCH MATHEWS, L.D.S., Dean, Manchester Dental Hospital.

W. St. C. McCLURE, M.R.C.S., L.R.C.P., D.P.H., Deputy Medical Officer of Health, Manchester.

Mrs. SYDNEY McDougall, Manchester Ladies' Public Health Society and Salford Mothers' Guild.

JAMES MCGHEE PRESCOTT, late St. Helens.

J. H. D. MELLOR, Glossop Education Committee.

Mrs. EDWARD MELLANBY, Sheffield, late London.

SIR WILLIAM MILLIGAN, M.D.

Miss H. P. MOORE, Superintendent Blackburn District Nurses' Home.

Miss MILLICENT MURBY, Health Insurance Department, Ministry of Health.

ALFRED A. MUMFORD, M.D., M.R.C.S., Medical Officer, Manchester Grammar School.

JAMES NIVEN, LL.D., M.A., M.B., Medical Officer of Health, Manchester.

Miss GRACE OWEN, Principal, Mather Training College, Manchester.

J. LEWIS PATON, M.A., High Master, Manchester Grammar School.

A. PEARCE, Assistant Manager, S. S. White Co.

Lieut.-Colonel F. S. PENNY, R.A.M.C., Whalley Hospital.

Miss FLORENCE PETTY, M.C.A., Assistant Treasurer, Food Education Society, London.

A. T. PITTS, D.S.O., M.R.C.S., L.D.S., British Dental Association.

C. H. PRESTON, M.O., Curator, Manchester Dental Hospital Museum.

MEMBERS

341

- GEORGE M. RAEBURN, L.D.S., School Dentist, West Riding Education Committee, Harrogate.
- SYBIL, Viscountess RHONDDA, D.B.E., Hon. Treasurer, Food Education Society.
- C. W. SALEEBY, M.D., F.R.S.E., F.L.S., London.
- Miss C. V. SCHWEMMER, Manchester Schools for Mothers.
- Mrs. SIDLEY, Manchester Branch, National Council of Women.
- WILLIAM SIMS, L.D.S.
- H. P. SHOESMITH, L.D.S., School Dentist, Huddersfield Public Health Department.
- Captain ARTHUR T. SPAVEN, L.D.S.
- Miss NORA TEALE, Secretary, Manchester Invalid Children's Aid Association.
- F. R. THOMPSON, Secretary, East Ham Education Committee.
- GEORGE THOMSON, L.D.S., School Dentists' Society, London.
- F. HERBERT TOYNE, Secretary, Brighton Education Committee
- HUGO VOSS, Dental Student.
- J. SIM WALLACE, D.Sc., M.D., L.D.S., London.
- HAROLD WALLER, M.B., B.C., M.R.C.S., London.
- HAROLD WALMSLEY, School Dentist, Stockport Education Committee.
- A. W. WELLINGS, L.D.S., President, Central Counties Branch, British Dental Association, Birmingham.
- JAMES WHEATLEY, M.D., D.P.H., Medical Officer of Health and School Medical Officer, Shropshire County Council, Shrewsbury.
- C. DOSWELL WALLIS, L.D.S., M.I.H., Chief School Dentist, West Sussex and Chichester Joint Education Committee, Worthing.
- Mrs. WHITTAKER.
- G. O. WHITTAKER, L.D.S.
- ROBERT B. WILD, M.D., F.R.C.P., Dean, Medical Faculty, University of Manchester.
- ARTHUR G. WILKINS, Senior Medical Inspector, Staffordshire Education Committee, Stafford.
- Miss MARGARET WILKS, Superintendent, Stirchley (Bournville) School for Mothers.
- T. P. WOLSTON WATT, L.D.S., Senior Works Dentist, Messrs. Cadbury Bros., Dental Department, Bournville.
- Miss MAY YATES, Hon. Secretary, Bread and Food Reform League, London.

N.B.—In addition to the above, a number of dental and domestic science students, teachers and nurses in uniform were, in accordance with an announcement made by the Committee, admitted free.

GENERAL COMMITTEE OF THE CONFERENCE REPRESENTATIVES OF ORGANISATIONS.

MANCHESTER SCHOOL FOR MOTHERS.—Mrs. Hadfield ; *Mrs. E. T. Scott, Hon. Secretary (vice Miss H. K. Armitage, resigned).

MANCHESTER AND SALFORD DISTRICT NURSING ASSOCIATION.—Miss L. Blyton ; Miss Winifred Andrews, Secretary.

LADIES' PUBLIC HEALTH SOCIETY AND SALFORD MOTHERS' GUILD.—Mrs. Sydney McDougall ; *Mrs. H. Ashburner, Hon. Secretary.

MANCHESTER EDUCATION COMMITTEE.—Sir Thomas Shann, Chairman ; Spurley Hey, Director of Education.

MANCHESTER, SALFORD AND DISTRICT GIRLS' CLUB UNION.—Mrs. Lillie ; Mrs. Walter Beer, Hon. Secretary.

INVALID CHILDREN'S AID ASSOCIATION.—Mrs. W. H. Zimmermann ; *Miss N. Teale, Secretary.

MANCHESTER AND SALFORD SANITARY ASSOCIATION.—W. Thomson, F.C.I. ; The Rev. J. H. Wilson ; Fred Scott, Secretary.

MANCHESTER TEACHERS' ASSOCIATION.—*T. Brown ; *W. P. Ewing, Secretary.

WOMEN'S GUILD OF SERVICE.—Mrs. E. A. Phillips, Secretary.

CRIPPLED CHILDREN'S HELP SOCIETY.—George Gill, Chairman ; Fred Hargreaves, Hon. Secretary.

NATIONAL COUNCIL OF WOMEN.—Mrs. Sidley ; Miss Edith Moorhouse, Secretary.

CHILD STUDY SOCIETY.—Miss Eggar, Hon. Secretary.

PATHOLOGICAL SOCIETY.—John F. Ward, M.D., Hon. Secretary.

MATERNITY AND CHILD WELFARE COMMITTEE.—Mrs. George King.

MUNICIPAL TRAINING COLLEGE.—Miss Alice M. Jackson, Vice-Principal.

ODONTOLOGICAL SOCIETY.—*J. Hilditch Mathews, L.D.S., Dean, Dental Hospital ; *David Headridge, L.D.S. ;

*Edwin Houghton, L.D.S. ; *H. W. Norman, L.D.S. (resigned).

BRITISH MEDICAL ASSOCIATION.—*R. G. McGowan, M.D.

MANCHESTER PUBLIC HEALTH COMMITTEE.—*Alderman Jackson, Chairman.

BOY SCOUTS.—Arthur Gaddum, Commissioner, S.E. Lancashire.

INDIVIDUAL MEMBERS.—*Councillor Margaret Ashton, M.A. ; *A. Brown Ritchie, M.B., C.M., School Medical Officer ; G. G. Campion, L.D.S. ; Miss Catharine Chisholm, M.D. ; The Rev. S. F. Collier ; The Very Rev. the Dean ; *Mrs. Douglas-Drummond, L.R.C.P., L.R.C.S. ; Mrs. Eckhard ; *Miss M. Fitz Gerald ; Councillor Caroline Herford, J.P. ; *T. C. Horsfall ; Miss Margaret Langdon ; *Miss May Lennard ; *T. Lomax ; Mrs. Mackintosh ; *C. H. Melland, M.D., M.R.C.S. ; *W. St. C. McClure, M.R.C.S., L.R.C.P., D.P.H., Deputy Medical Officer of Health ; *Sir William Milligan, M.D. ; *A. A. Mumford, M.D., M.R.C.S. ; Sir Christopher Needham ; *James Niven, LL.D., M.A., M.B., Medical Officer of Health ; The Rev. J. E. Roberts ; Miss Beatrice Rogers, Warden, University Settlement ; Miss E. J. Ross, Principal, Manchester Municipal Training School ; the late Mrs. Henry Simon, O.B.E. ; Sir William Stephens, Salford Education Committee ; Mrs. Scott Stevenson ; *D. P. Sutherland, M.B., B.S., Tuberculosis Officer ; *Sir William Thorburn, K.B.E., C.B., M.D. ; W. R. Walton ; G. O. Whittaker, L.D.S. ; R. B. Wild, M.D., F.R.C.P., Dean, Medical Faculty Manchester University ; B. Wilde, Blackley Municipal School.

Those marked with an asterisk form the Executive Committee, with Dr. W. St. C. McClure as Chairman.

THE VOICE OF THE PRESS.

“A GOOD PRESS.”—[When Mr. Lewis Paton, High Master of the Manchester Grammar School and Chairman of the final session, remarked :—“You have had a good Press,” he paid tribute where tribute was undoubtedly due. Notwithstanding paper shortage and the claims of other news, the Press did nobly by the Conference and brought its main

features and conclusions before millions of readers. Its all-powerful aid in making this volume known to the public may with equal confidence be anticipated. We have only space here to quote a few of the comments. Among other papers which gave reports of the proceedings, or publicity in advance, the following may be mentioned: *Times*, *Morning Post*, *Daily Telegraph*, *Daily Mail*, *Daily News*, *Daily Express*, *Daily Sketch*, *Daily Mirror*, *Westminster Gazette*, *Pall Mall Gazette*, *Liverpool Courier*, *Yorkshire Post*, *Nottingham Post*, *Glasgow Evening News*, *South Wales Argus*, *British Medical Journal*, *Lancet*, *Medical Officer*, *School Government Chronicle*, *Journal of Education*, *Lloyds News*, *Dental Record*, *English Mechanic*, *Despatch*.—Ed.]

CONFERENCE ON TEETH.¹

AN EGYPTIAN SKULL BECOMES AN OBJECT LESSON.

The first conference ever organised to discuss the prevention of diseases of teeth will begin in Manchester on May 13th.

It has been arranged by the Food Education Society, and Mr. Charles Hecht, the hon. secretary, told a *Daily Chronicle* representative yesterday that it will be attended by leading members of the medical and teaching professions, and representatives of public health bodies.

"Sir George Newman recently remarked that the dental problem remains, after ten years of school medical service, one of the most important, urgent, and difficult of all problems," Mr. Hecht said.

"The subject of dental treatment will be dealt with in a popular, rather than a technical, manner, so we hope that it will prove interesting to the public. Some of the lectures will be illustrated with lantern slides, and there will be an exhibition devoted to the development of teeth and jaws from the earliest years to adult age.

"An Egyptian skull will show the effect of hard use upon teeth."

Mr. Hecht, who is an expert on food matters, will contribute a paper on educational methods for improving the teeth of children and adults.

¹ Reprinted, by permission, from the *Daily Chronicle*, May 6th, 1920.

OUR NARROW JAWS.¹

UNFAVOURABLE COMPARISON WITH MAORI MOUTHS.

ODES TO STALE BREAD.

ABOMINATION OF THE SOFT POTATO.

"At least nine-tenths of our teeth trouble is preventable."

"How?" our representative challenged the gentleman who made the remark, Mr. C. E. Hecht, M.A., secretary and organiser of the three days' Food Education Congress, starting in the Albert Hall, Manchester, to-morrow.

"By diet. If we can rectify our dietetic errors we can work rapid improvement in the nation with the worst teeth in the world—England."

The society views with concern that

Eating has gone out of fashion.

That we, as a nation, bolt our food.

That the strength and beauty of our national jaw is imperilled, and may cease eventually to have a function at all—like the appendix.

"Take the narrow jaw of an Englishman and note its difference from the jaw of an uncivilised Maori," said Mr. Hecht. "This is due to the ill-balanced character of our diet. Bread and milk as a staple article of diet is a curse and mashed potatoes an abomination. These soft foods are largely eaten by brainworkers."

I pressed for information how the needed reform could be wrought, and was told: "Get people to take longer over their lunches, and particularly over their breakfasts." Food that the eater was bound to bite on, bound to masticate and dally over, should be placed on the table—"such as this unpatented 'scrunch,'" the secretary said, handing me out of a cardboard box a thin piece of stale bread dried in the oven. "The boys of Malvern College call it 'crusk,' and the girls at a South Coast College have written some very witty poems about it. They call them 'Odes to Scrunch.' I myself have often been called 'Mr. Scrunch,'" the secretary concluded.

¹ Reprinted, by permission, from the *Manchester Evening News*, May 12th, 1920.

THE TEETH WE DESERVE.¹

Through terror to something quite other than triumph is the course of every recurring discussion of the nation's teeth, and the experts who enjoyed themselves over this subject in Manchester yesterday ran true to form. Our people, these alarmists averred, have the worst teeth in the world. They do not know what to eat or how to eat it, when to eat it uncooked, how to cleanse the mouth, in what manner to ensure an adequate daily spell of dental gymnastics. Lady Rhondda's remedy for the mischief is the munching of hard crusts, which of course is good advice. But Lady Rhondda overlooks the grave fact that the British crust is not what it was in the fine old days of stone-milling and before the introduction of fancy forms of baking. "Give us back the delicious crusts of forty years ago!" would on the whole be a sounder hygienic cry than that suggested by the humorous doctor's catalogue of mouthwashes disapproved of Pussyfoot. The list came to an appropriate close in dry champagne, but it is fair to note that it included nearly all the drinks consumed by civilised man. The subject is enormously important, as most people came to realise when the war medical examinations disclosed the facts as to the national dentition. It must, we fear, be acknowledged that the people of these islands give less attention to the care of the teeth than any people in the civilised world, while as compared, say, with two such widely contrasted nations as the Indians and the Americans we are singularly and deplorably indifferent. The experts yesterday demanded a greatly extended dental service. That, of course, is urgent, but the vital need is dietetic education and systematic preventive care.

THE CARE OF THE TEETH.²

Speakers at the conference arranged by the Food Education Society at Manchester yesterday were agreed upon one point, and that is that the teeth of the English people are in a deplorable condition. There was agreement, too, on some of the causes of this state of things—sloppy food and an over-indulgence in sweets. These, it can hardly be denied, con-

¹ Reprinted, by permission, from the *Manchester Guardian*, May 14th, 1920.

² Reprinted, by permission, from the *Liverpool Post*, May 14th, 1920.

tribute in some measure to dental decay; but when we blame soft food and sweets it must be remembered that in certain other countries, where the food is just as sloppy as ours and soft sweets are eaten in considerable quantities, the teeth of the people are strong and healthy. It is said, indeed, that even in this country the teeth of people in the South, who, we presume, are no more Spartan in their way of living than those of the North, are still comparatively good. The truth is that what we as a people generally suffer from is neglect of the hygiene of the mouth. We have not yet wakened or been wakened to the necessity for the care of the mouth, and the result is not only disease of the teeth but many other diseases as well. Instruction is now being given in schools, and great benefit must come from this. Perhaps, too, if we could greatly increase the supply of good cheap fruit we should be doing something to prevent many ills that come from ill-tended mouths.

FOOD AND THE TEETH.¹

HOW TO PREVENT DENTAL DISEASES.

Food reformers, doctors, dental surgeons, dentists, students, and some members of the general public, on Thursday and yesterday assembled at the Albert Hall, Manchester, at a conference organised by the Food Education Conference, to talk nationally and rationally upon the prevention of diseases of the teeth. Many sessions were held during the two days, and a number of important papers on food and teeth—kindred subjects—read by people well qualified in their different branches of study and practice. The conference was opened on Thursday morning by Sybil, Viscountess Rhondda. It will be continued to-day. Last night a *conversazione* was held at the College of Technology.

The papers dealt with up to last evening were chiefly concerned with diagnosing the origin and continuance of dental troubles, and indicating in many ways how these, amid the diseases which bad teeth cause, may best be avoided. From the conclusions of the various speakers it is clear that changes in the diet are largely responsible for the appalling condition of the teeth of civilised men to-day. Many dis-

¹ Reprinted, by permission, from the *Manchester City News*, May 15th, 1920.

orders of health in young children point to a common source of origin—some interference with nutrition in the early months in the first year of life, while diseased teeth in a nursing woman are capable of disturbing the health of her baby at the breast. With dental attention no child need be exposed to risks. Its temporary teeth, although lasting only a few weeks, are of great importance, because the child is growing, and therefore, requires nourishment.

Most people are not aware that bad teeth are responsible for a loss of general health, and a wider and truer knowledge of dental hygienics is necessary. Hints were given upon the proper method of keeping the teeth clean, and it was asserted that toothless gums are not natural even to age.

Other notable points in the various addresses were as follow :—

Dr. Harry Campbell: We have the worst teeth of any nation. It is a national disgrace which should excite a feeling of shame and humiliation. No wonder such a state of things existed; we did not masticate our food properly, and were not brought up on the proper diet. When we lose a tooth we ought to retire to our chamber, solemnly draw the blind, and read the burial service.

Sir William Milligan (Manchester; chairman Thursday morning's session): In a large number of cases of cancerous condition of the floor of the mouth, he had been constantly struck by the fact that the persons were suffering from a septic condition of the mouth. There might possibly be some relation between septic teeth and malignant diseases of the mouth, and there was need for a thorough overhauling of the dentures of every one of us.

Colonel J. G. Adami (Vice-Chancellor of Liverpool University): We should ensure that only fully qualified persons be allowed to practise dentistry. About 10,000 more qualified dentists were needed to care properly for the country's teeth.

Dr. J. Sim Wallace: There would be better mastication if fresh fruits and uncooked vegetables were eaten in the form of salads. The best liquids to cleanse the mouth were tea (preferably Russian fashion, with a slice of lemon), coffee, water, soups, beef tea, beer, wines, and (most excellent) dry champagne.

Dr. J. Wheatley : Eating sweets was a cause of dental caries (destruction of the hard part of the tooth commencing on the outside).

Mr. J. H. Badcock : The more use, and the harder use to which the jaws were put from birth onwards the better.

Miss M. Yates (secretary, Bread and Food Reform League) : The struggle for existence to-day causes a special and continuous strain on the nerves, while modern customs deprived the food of essential nerve nutriment. She urged that wholemeal bread should be used. In the course of an interesting speech she mentioned that as teeth and bone consist principally of phosphate of lime, it is of the utmost importance that the food should contain an abundant supply of these essential elements. Owing to modern over-refinement of cereals lime starvation is now a real danger. No amount of cod liver oil alone could produce teeth. Phosphate of lime must also be present in the food.

Whole wheat meal contains double the amount of lime that is found in white flour, whilst the soluble phosphates combined with the lime found in salads, green vegetables, and other foods would form the essential phosphate of lime so necessary for the nourishment of the nerve, brain, and tissues, as well as the formation of bones and teeth. Whole wheat meal has about three times more of the essential phosphoric acid than white flour. Miss Yates declared that national dietaries of countries where dental caries is prevalent show that the white flour of wheat and maize have a most prejudicial effect on the teeth.

DECAYED TEETH.¹

Many people will be delighted to hear that champagne is an excellent mouth-wash, and has a tendency to prevent the decay of teeth. The teeth of the people of this country are in a really awful condition, and the inside of the mouths of too many persons of adult age presents a shocking appearance. At a conference of dentists which has just been held it was stated that the teeth of the people of England are the worst in the world. If that be the case, as it probably is, the matter requires urgent attention. Decay of the teeth

¹ Reprinted, by permission, from the *Nottingham Guardian*, May 15th, 1920.

is said to be due to the consumption of sugary and starchy food, but champagne is such a delightful remedy for anything of this kind that most people who can afford it will resort to it gladly. The consumption of uncooked fruit is also regarded as a good remedy, and this, too, most people will find pleasing. In any case, the decay of the teeth must necessarily be a great source of mental and physical weakness, involving eventual national decay. Besides which, the suffering which many people have to endure from toothache is a great disadvantage to the earning of a living. If, therefore, any plan can be devised to prevent the decay of teeth it ought to be provided at once, and parents should teach their children how teeth can best be preserved. Skeletons of old Roman soldiers of considerably more than middle age are sometimes dug up, and it is found that the teeth are intact. It is doubtful whether this would be the case of one person in five thousand of similar age in England to-day!

TALK FOR THE TIMES.¹

SANS TEETH.

"Toothless gums are not natural, even to age," said a doctor at a Manchester conference the other day.

He probably forgot Shakespeare's description of the actor in the last scene of all this strange eventful history, sans teeth, sans taste, sans everything. But this dictum is not so much an aspect of Shakespeare's inevitable message as an evidence that Englishmen in his day were as careless concerning their teeth as Britons of this dadaist age.

There are those who see in Shakespeare the seeds of all modern movements, from the jazz jumble to the most slangy of R.A.F. linguistics. So this wistful picture of age is probably a subtle appeal for more vigorous application of some new dentifrice patented by an alchemist pal of Will.

Let us take it to ourselves and decide by experiment whether a man of 80 or 90 may retain a complete set of natural teeth. If we only could decide! But we cannot. Our teeth are the product of generations of neglect.

There's the food we eat—or don't eat, for the number of feeders in a café who shamelessly bolt their food without

¹ Reprinted, by permission, from the *Glasgow Evening Times*, May 17th, 1920.

a decent chew or proper mastication is astonishing. Take a look round and see for yourself, and estimate the ill effects on the city's digestion.

Well, what should we eat to keep our teeth white and strong and regular and clean in composition and in appearance ? Doctors have such a variety of advice on the food that should be eaten to prevent various maladies, that the war period with its virtual starvation was positively a period of rest for the weary eclectic. There was so little in the shops, and what was there was bad. So most of us had to take it and trust to luck for the effects.

But this much can be said for the experience, that we were deprived of much stuffing that would have injured our teeth. For instance, the lack of sugar and consequently of sweetmeats is reported to be responsible for the improvement in the teeth of the children in the Salop district.

True, all nice, fat, cheerful people are guilty of outrunning their sugar ration, but I regret that they have not usually such a handsome set of teeth to show as, say, Jews and Poles have who make sparing use of sugar and more lavish use of fatty foods. War bread, too, gave us all food for grousing ; but I must irritate you by declaring that it was a safer, if less sweet, morsel for the teeth than white doughy bread. And crusts ! Commend me to a nice crisp, brown crust. There's that clean roughness and resistance about it that sets the teeth a healthy desirable effort to break. But, alas, for the crusts of our youth !

That wail is equivocal. I was bemoaning the rich, well-cooked crusts of a few decades ago. I was not, at the moment, referring to the lost and wasted crusts of the young people of to-day.

But now for them.

The medical examinations of the army resulted in the demobilisation of thousands of teeth because of their unfitness for further service. They were the teeth of young people. Middle-aged people who can display a good set of natural teeth are still rarer, though doctors tell us that nine-tenths of the disease of teeth is preventable.

Is it necessary to state that childhood is the time for prevention ? Begin by feeding your children wisely. Teach them to do with less sugar and sweeties, and to eat and enjoy

the fatty foods and crusts that are the proper food of the teeth.

And teach them the enjoyment of teeth gymnastics. I don't mean that they should be trained to gyrate in the upper air of the nursery, attached by the molars to a trapeze. But insist on the vigorous application of the toothbrush with that regularity of habit that will make an omission of the exercise sufficient reason to spoil a day's happiness. You know that the poorest Hindoo mendicant never begs for food without also asking for water to cleanse his mouth afterwards. And you know, too, that a subject for frequent cartoon among foreigners is the toothless mouth of the Briton. Don't you think that your children should be taught and trained to take care of their teeth, and to clean their mouths habitually and naturally as well as the Hindoo beggars?

The health authorities are proposing a much more intensive inspection and care of school children than was ever previously intended. The care of the teeth is one of their primary objects. See that you help their efforts. Don't be prejudiced and talk senselessly about State interference and fads.

The care of the teeth is no fad.

Is it necessary to recall the unpleasant and painfully obvious objections that any normal person has against the careless people whose teeth are all wrong? Of more importance to the ill-toothed, they injure their own constitution. Doctors will not be surprised if the rather vague origin of cancer is at least partly traced to the septic condition of the victims' mouths. And stomach disorders result from and react on neglected teeth.

Toothache leaves me speechless.

Don't let your children run the risk of cancer or indigestion or toothache, or the unpleasantness of spoiling their comely features by irregular or ill-coloured teeth. Begin right now by marshalling them regularly to teeth drill.

Make it a parade!

HAL O' THE WYND.

FOOD EDUCATION: THE CAMPAIGN FOR HEALTHY TEETH.¹

It is about ten years since British authorities concerned with the care of children began to take up the problem of their teeth in relation to health and efficiency. Up to that date most people were indifferent to the matter, taking it for granted that some children naturally had bad teeth and others had good. In many parts of Great Britain dentistry was altogether neglected until the moment arrived when all teeth had to be extracted from a patient, and a new dental set supplied. Instead of inquiring into the causes for these defects the average individual accepted the state of matters, and simply envied the people of the East, Continental nations, and Americans, all of whom were more fortunate in their dental condition than themselves.

Inquiry into the state of matters arose from the lack of efficiency of a great proportion of the men and women of the country. When mobilisation took place, thousands of men had to be treated by dentists or were altogether rejected from the army owing to the condition of their teeth. Toothache has always been looked upon as a trifling matter, but wise scientists knew more about it than even the sufferers, and they started a great campaign to teach people the relation of mastication to digestion, and what digestion meant to health.

TOOTHBRUSH DRILL.—Toothbrush drill was started in the schools, and children who had never even seen a toothbrush were taught to use it properly, with the result that considerable improvements were effected. A marked increase has taken place, not only in the number of qualified dentists, but in the methods they adopt, their supply of instruments as well as the quality of them. Care of the teeth has become scientific here, as it has been for years in America, and there are not nearly so many unsightly mouths through neglected teeth as there used to be. Indeed, at one time it was not unusual to see a woman most beautifully dressed, with all her appointments correct and expensive save her teeth, which resembled more a set of darkened and broken fangs

¹ Reprinted, by permission, from the *Bulletin*, Glasgow, May 13th, 1920.

than the teeth of a human being. Regular visits to the dentist have lost their terror owing to improved methods as well as to more generally diffused knowledge of the necessity for these periodic consultations.

AN INTERESTING CONFERENCE.—Now education is taking up the subject of food from a scientific point of view. An important conference is being held to-day in Manchester, and from the information sent out mothers will learn how to feed their children properly with a view to starting them in life, not only with good teeth, but with a real understanding of the necessity of studying food values in relation to health and efficiency. The Food Education Society, under whose auspices the conference is to be held, have already met three times in London, where essential subjects have been discussed. Now experts are to deliberate on such matters as the extent and consequences of dental disease, for bad teeth are now regarded as a disease, not merely as a condition which must be endured more or less patiently. Dental caries, from the point of view of cause and prevention, will be dealt with, and those who are doubtful as to the question of the effect of sweets on the teeth will have solid facts put in front of them for their correct information. Mothers will hear how pre-natal care will prevent diseased or defective teeth in children, and they will also be told how errors in diet are amongst the causes of irregularities of the teeth and how certain dietetics act as factors in the development of both teeth and jaws.

CHAMPAGNE AS MOUTH-WASH.¹

Dry champagne as a mouth-wash was recommended by Dr. Sim Wallace, of the London Hospital, at the Manchester conference on diseases of the teeth. As champagne is £2 10s. a bottle, and assuming that a glass was sufficient for three washes, each wash would cost 3s. 3d. At £1 10s. a bottle every mouth-wash would cost 1s. 8d.

¹ Reprinted, by permission, from the *Daily Mirror*, May 17th, 1920.

TO A DENTIST.¹

["Dry champagne is an excellent mouth-wash."—Dr. SIM WALLACE, at a Conference on Prevention of Diseases in Teeth.]

While in your dismal *salle d'attente* I wait
 And with forgotten *Punches* idly toy,
 How it will reconcile me to my fate
 To muse upon the mouth-wash you employ.

Or, squirming in the plush-upholstered chair,
 How shall I thrill with valour to observe
 Among the implements of torture there
 A magnum of the best, to brace my nerve.

Not the hooked probe nor hum of whirring file,
 The fearful forceps nor the needled lance
 Will wholly banish my expectant smile
 That greets "the foaming grape of Eastern France."

E'en in that pass whereat the boldest blench,
 The "aching time" will quickly turn to bliss,
 When, having borne the devastating wrench,
 I hear you murmur, "Rinse your mouth with this."

I thank you, Dr. Wallace, for that word;
 My teeth, I'm sure, require attention soon;
 Ah! Widow Clicquot, how my heart is stirred!
 Appointment? Right. To-morrow afternoon.

A COMPLIMENT TO MANCHESTER.²

The conference held on Thursday, Friday, and Saturday this week at the Albert Hall, Manchester, "On the Prevention of Diseases of the Teeth," is promoted by Mr. Charles E. Hecht, of the Food Education Society, and should prove attractive to a large circle of health workers. Nurses in uniform and health visitors are admitted free. Popular papers are to be read, round which discussion will centre.

¹ Reprinted, by permission of the Proprietors of *Punch*, from the issue of May 26th, 1920.

² Reprinted, by permission, from the *Hospital*, May 15th, 1920.

There is an exhibition and a bookstall, where useful books and pamphlets may be examined and acquired. Manchester is a very good place to select for this useful gathering, for its people have a reputation for the open ear and the seeing eye. It is high time that food reformers should concentrate attention on the question of teeth preservation, for the best authorities are united in believing it to turn on sound principles of nutrition, just as nutrition itself depends largely on the possession and right use of good teeth.

THE CONSEQUENCES OF DENTAL DISEASE.¹

SOME CONCLUSIONS DRAWN AT THE MANCHESTER MEETING.

In a journal which has the well-being of the public closely at heart, it is unnecessary to offer excuse for again giving space to discussion of one of the most important national problems of the day. As was announced last week, an extremely valuable exposition of the far-reaching results of dental disease in Great Britain has just been put forward in the Albert Hall, Manchester, and although among so admirable a set of papers many might well be treated individually, it will perhaps be most advantageous to summarise the whole. To the professional man some of the facts enlarged upon may appear to be given undue prominence, but in making our abstracts we hope to bear particularly in mind those points which, though well known to the doctor himself, are certainly not realised by his patients, and are therefore just those which he must more insistently bring before them, and they be more ready to understand and accept.

A NATIONAL DEFECT.—It is a practically indisputable fact that we have the worst teeth of any nation. By this it is not meant that we have necessarily an unenvied monopoly in actual decay or liability of our teeth to decay. Rather must it be pointed out that we hold as a nation the highest percentage incidence over the whole population of a series of dental conditions and consequences. The chief are irregularities of the teeth, loss of teeth due to extraction and untreated disease, unnoticed dental caries, concealed disease of the fang-tips and pyorrhœa, or disease of the tooth sockets. The great point is that some nine-tenths of the contributory

¹ Reprinted, by permission, from the *Hospital*, May 22nd, 1920.

causes to the country's present dental deficiencies *are absolutely and readily preventable*. It is almost unnecessary to labour the secondary consequences of these conditions, but we may, apart from the more obvious results, mention defective mastication, leading through indigestion to gastric or duodenal ulcer and therefore to malignant disease. Also let us remember that dental sepsis is now universally recognised as one of the common causes of arthritis and neuritis arising primarily from toxic absorption; chronic "blood poisoning" let us call it, if that term will frighten more people into taking rational precautions in the care of their teeth. It is only by making the public understand that the campaign now opening is bringing to them something more than "an aid to fitness" that we shall get that universal and voluntary sympathy which is more than essential to success.

IRREGULARITIES.—Let us take, therefore, these conditions in order. The first factor in preventing irregularity of the teeth is to make sure that the young infant follows as far as possible natural conditions of living. To a large extent the problem of prevention at this stage resolves itself into a question of food. This must be of such a nature and consistency, and eaten in such a manner, as to maintain the mouth in a physiologically clean condition and to provide sufficient exercise of the jaws. Above all, small children should *not* be fed as though they were invalids, but should encounter a reasonable amount of coarse food such as their dental equipment is designed to cope with. The responsibility, so far, largely rests with the mother herself, and if under her care the infant develops the habit of correct mastication an invaluable start has been made. On the progress immediately following, some valuable points were put forward by Mr. A. T. Pitts. He explained that the index to the value of the teeth to any child is to be found in the amount of their "attrition" or wearing down by opposed surfaces. Marked attrition is in these days no longer found in the adult as a normal occurrence, but it is a normal sign in the child. Although the accepted immediate cause of caries is the fermentation of carbohydrate food in contact with the teeth, a variety of predisposing causes include irregularities and "crowding" of the teeth, arising in great number of cases

from irregular mastication, which is itself readily shown by the "attrition marks." If there is any deficiency or perversion of the jaw movements in the child, we may expect this to be perpetuated in the adult, and the frequent occurrence of unilateral mastication unaccounted for by absence of teeth provides ample confirmatory evidence.

TEETH—UNBALANCED USE OF.—It is needless to enter upon the liability of such unbalanced use of the teeth in the production of food accumulation, fermentation, and ultimately caries, but it may, however, be truly said that all dental irregularities do tend, on such lines as the above, to predispose to decay. Also, in the production of this irregularity, there are factors other than deficient mastication; and as their detection depends almost entirely upon the mother's care in such matters, we would particularly have her attention drawn to the following facts, cited by several speakers.

Among the mechanical factors tending towards irregularity, we have also premature loss, or too late retention, of the milk teeth, whereby the incoming tooth is deprived of a guide or deflected from its course by an obstruction; thumb, finger, or comforter sucking. Also mouth breathing may develop, which, by compelling the mouth to be kept open, deprives the upper jaw of the moulding action of the tongue. Premature *loss* of the temporary teeth is almost invariably due to extraction necessitated by *preventable* caries. Late *retention* of the temporary teeth may also be due to caries which, by causing the death of the nerve, interferes with the normal process of absorption. Hard food is required to displace a tooth when it is ready to be shed, whereas, if the food be soft, it may not exert sufficient force to dislodge it, and it may be retained beyond its time. Such are the simple facts, and for the moment it is best to leave the various theories concerning the effect of the growth factors, vitamins, internal secretions, etc., upon the early dentition.

DENTAL CARIES.—Dr. James Wheatley convincingly explained that whatever the causes may be, the only way in which dental caries commences in any otherwise healthy unbroken tooth is by the solution of its enamel by acids formed from carbohydrates in the food. The enormous increase of caries during the last century has synchronised with both a great

refinement in our starchy food and a great increase in our sugary food. Nowadays only a minute percentage of our population is free from carious teeth, and we believe with the speaker that this incidence has arisen from the gradual elimination from our diet of rougher foods which *cleanse* the teeth and their substitution by a host of manufactured highly refined products which allow sugary material to adhere to and ferment upon the enamel surfaces. Sweet eating may be included if we will, but a most interesting point is raised by the fact that in a particular district under observation the teeth of those children who are at the present moment four to five years of age are, as compared with those of the average four to five year olds of pre-war periods, far freer from active caries. These children, born about 1915, have been subjected to war restriction and modification of food practically all their lives. Their sugar consumption was halved, their flour much less "refined," their crusts eaten and not thrown away. True it is that their parents inevitably encountered a great revival of activity in health visiting, etc., but, nevertheless, the coincidence is significant.

Mention has already been made of the vital importance of mastication. The vigorous action of the tongue, the jaw muscles and the lips, and the regular working and regular disposition of the teeth in mastication all play a necessary part in a natural cleansing process. In short, the people of the country are urged, both for themselves and the children they are rearing, to realise that the appreciably poor structure of the teeth of civilised man is largely due, directly and indirectly, to the very artificial foodstuffs which form a high proportion of his diet. The ideal is perhaps nowadays unattainable, and too urgent striving towards it results readily, indeed, in absurdity and fad; but, nevertheless, we have to get back to physiological requirements, to Nature's original requirements. It is said that nine-tenths of dental disease is preventable, and the statement is absolutely true. Inspection and care of the teeth themselves may do much to prevent early disease from advancing, but the essential part of the whole campaign is the education of the public, particularly the mothers of the country, in the simple physiological requirements. Fortunately, the meeting at Manchester has

done much to show the way this education may be one day realised.

THE PREVENTION OF DENTAL DISEASE.¹

The recent Congress held by the Food Education Society at Manchester, for the purpose of emphasising the importance of preventing dental disease in this country, may be claimed as a complete success. The papers were without exception admirable, and the interest of the meetings never for one moment flagged.

The congress was opened by the Dowager Lady Rhondda under the presidency of Sir William Milligan. In his opening address Professor Adami deplored the dreadful state of the British teeth and the lack of sufficient dentists to look after them; and he urged the need of a large increase of fully qualified dentists.

Personally, I am not so much interested in augmenting the supply of dentists as in lessening the need of them. It is probably no exaggeration to say that nine-tenths of the dental disease in this country is preventable. Even if this proportion were prevented, there would still be many millions of carious teeth and pyorrhœic sockets to keep the dentists busy. It is surely upon prevention rather than upon cure that our efforts ought to be concentrated.

THE COMFORTER.—Every doctor is agreed that thumb-sucking is not a permissible means of quieting a restless child. Mr. Badcock has made an interesting observation in connection with the practice of this pernicious habit. He has noticed that while the child applies the thumb of one hand to its mouth, with the other hand it manipulates some soft substance, the two hands working in association.

This associated movement, Mr. Badcock suggests, is an imitation of the instinctive behaviour of the child when at the breast: while the child tugs at the nipple with his mouth, he rhythmically clutches the breast with both hands, and in this dual way reflexly excites the flow of milk.

INFLUENCE OF VITAMINES ON THE TEETH.—Mrs. Mellanby explained the results of her experiments on puppies, designed

¹ Reprinted, by permission, from the *Medical Press*, May 20th, 1920.

to show the effect of a diet deficient in vitamins on the development of the jaws and teeth. These experiments raise the question whether, if the expectant mother and the infant receive a deficiency diet, the teeth of the child may not fail to develop properly, and thus be morbidly prone to caries.

ORAL HYGIENE.—It may be regarded as certain that dental caries is due essentially, not to any morbid proneness on the part of the teeth to decay, but to unhealthy conditions of the mouth operating upon the teeth from without. If the mouth is kept clean dental caries does not occur; caries is not a process which begins spontaneously within the teeth, however ill-formed they may be. Indeed, Dr. Sim Wallace contends that ill-developed (hypoplastic) teeth are even less apt to decay than others.

CAUSATION OF DENTAL CARIES.—Caries is due to the lodgment of carbohydrate material (starch or sugar) in the crevice of a tooth, between two teeth, or between the gum and the tooth. The mass thus ensconced, becoming infected with bacteria, undergoes acid fermentation; the resulting acid dissolves the enamel (generally thought to be a dead material), and the exposed dentine is liable to be infected with bacteria and to become carious. If there is no acid to dissolve the enamel caries cannot occur. It follows that if the mouth is kept clean after taking food (which includes sweets), the teeth will not decay.

Biscuits, jams, and puddings are sticky foods which adhere to the teeth, and are not conducive to "oral hygiene." Crusty bread, raw fruit, and salads tend to leave the mouth clean.

THE CONSTITUTIONAL FACTOR.—The constitutional factor must not, however, be lost sight of entirely. It is possible that certain conditions of health may favour the occurrence of acid fermentation within the mouth by promoting the growth of bacteria; it is conceivable, for example, that the composition of the saliva and the buccal mucus may in this way stand in causal relation to dental caries. By promoting the digestion of starch, saliva tends to cleanse the mouth, and in Dr. Sim Wallace's view this is the essential function of ptyalin.

But though, owing to constitutional causes, it may be more difficult to keep the mouth clean at some times than others, yet by assiduous attention it ought at all times to be possible to render the mouth sufficiently clean to prevent the occurrence of caries. This, at any rate, should be our aim.

In short, if the teeth are more prone to caries in some states of health than in others, this is not due to any primary change in dental nutrition predisposing the teeth to caries, but to adverse conditions within the cavity of the mouth operating upon the exposed portions of the teeth from without.

It is generally said that the teeth are specially prone to decay during pregnancy and lactation; but I am not aware that any statistical proof of this statement has been advanced.

INFLUENCE OF WAR DIET ON THE TEETH.—Dr. James Wheatley, the Medical Officer of Health for the county of Shropshire, brought forward evidence tending to show that dental caries was less apt to occur on the war diet than on the pre-war diet.

Children who were five years old at the end of the war were entirely debarred from pre-war diet. Now, whereas in pre-war times the number of five-year-old children presenting no dental caries was only 5 per cent., among the war children referred to the number rose to 45 per cent. Making every allowance for possible fallacies, such, for instance, as might result from inadequate observation on the part of untrained medical inspectors, it really does seem as if the diet imposed by the war was less productive of caries than the pre-war diet.

Whether this apparent diminution in the incidence of caries is attributable to the war bread or the reduction in the supply of sugar or milk, Dr. Wheatley, with true scientific caution, hesitates to say.

THE NATION'S TEETH.¹

BY OUR MEDICAL CORRESPONDENT.

A DISGRACEFUL SHOWING AND ITS REMEDY.

Visiting Manchester the other day in the course of my attempt to abolish the "plague-cloud," as Ruskin called it, in that and all our cities, I was fortunate enough to have several spare hours relieved by participation in the National Conference

¹ Reprinted, by permission, from the *Observer*, May 30th, 1920.

on the Nation's Teeth, most usefully convened by the Food Education Society (late National Food Reform Association). Some public attention has been directed to the admirable papers read by doctors and dentists at that Conference, and the full report, including the discussions, will be valuable, poignant and interesting reading—as, for instance, in respect of the seriously destructive criticism levelled by Dr. Sim Wallace and others against the tooth-brush! Unfortunately, however, his jocular commendation of dry champagne as a mouth-wash received the headlines and chief comment, even in the most responsible journals, not to mention the House of Commons, and meanwhile we have a national disgrace and danger to recognise and remedy. Let us avoid the temptation to indulge in the amusing and intriguing discussions on the tooth-brush and its dangers, fine wines as mouth-washes, the vagaries of cowardice (as in many brave airmen) and courage (as in many frail old women) among dental patients; for the main facts must be set forth first. I cannot do better than transcribe exactly the author's own synopsis of the paper on “The Extent and Consequences of Dental Disease,” read by Dr. Harry Campbell, an original and acknowledged authority on dietetics and the distinguished editor of the *Medical Press and Circular* :—

DR. HARRY CAMPBELL'S INDICTMENT.—“We have the worst teeth of any nation. The state of our teeth beggars description. It is a national disgrace which should excite a feeling of shame and humiliation.

“Diseases of the teeth include :—(1) Irregularities. (2) Loss from extraction and shedding. (3) Decay. (4) Disease at the fang-tips. (5) Pyorrhœa, or socket disease.

“Regarding the extent of these among the British, dental irregularities are practically universal among us. Some hundred million teeth have been extracted. About the same number have been spontaneously shed. The decayed teeth number some two hundred million; there are about the same number of pyorrhœic sockets; finally there are some twenty million diseased fang-tips. *At least nine-tenths of this disease is preventable.*

“The consequences of dental diseases are :—(1) Malodorous breath. (2) Unsightliness (from irregularities, decay, long

teeth). (3) Pain (toothache, pain inflicted by dentist, fear of dentist). (4) Reflex disturbances. (5) Defective mastication (causing indigestion). (6) Secondary local disease (abscess and cancer). (7) Blood poisoning (arthritis, neuritis). (8) Economic loss (loss of time ; need of supplying army of dental surgeons)."

In the course of the discussion none of these statements was impugned in any degree, and the essential ones were confirmed. Those, then, are the shameful facts.

Dr. Harry Campbell was quoted in these columns some time ago as saying what is doubtless true, that we are the worst-fed nation in the world. And in the discussion here of the new dietetics, which mankind owes almost wholly to British men and women of science, there was shown that relation between diet and the dentition which may help us to correlate Dr. Campbell's deplorably accurate superlatives.

MRS. MELLANBY'S EXPERIMENTS.—Indeed, at the Conference in Manchester, Mrs. Mellanby not only read a valuable paper on her experimental work (which was discussed here some months ago), but also showed us a number of the jaws of young animals which had been supplied with varying quantities of food containing the "fat-soluble A," or "anti-rachitic vitamine," which is probably responsible for the proper development of the teeth as well as of the skeleton. Alas, that this precious substance should be, as she says, "on the whole associated with the more expensive articles of diet, such as eggs, butter, whole milk and animal fats." Observe now Mrs. Mellanby's experimental findings in puppies which received, instead of such things, only linseed oil, lard, separated milk and so forth ; and note how closely those results coincide with what we everywhere find amongst the children of our land to-day. They "showed, according to their size and rate of growth, some or all of the following defects:—(1) Jaw bones were soft ; (2) Teeth irregularly arranged ; (3) Delay in the eruption of the teeth ; (4) Defective enamel ; (5) Poorly formed and deficient dentine ; (6) Low calcium content of the teeth compared to their size ; (7) A much diminished resistance to disease."

I have already suggested that the dietary of the expectant mother receives a new importance when we realise that the

unborn child needs vitamins, which it cannot make for itself, and which the maternal body cannot make for itself, or for the child ; and have asked for experiments upon expectant animal mothers in order to elucidate this matter and the large proportion of still-births still unexplained and partly referable, I hazard, to vitamin deficiency. In Manchester, Mrs. Mellanby referred to certain experiments, of the kind postulated, which she is now carrying on ; and already, it appears, experimental evidence is being obtained which shows the importance of vitamin supply (through the mother's diet, of course), during the rapid growth that occurs before birth. The so-called "milk-teeth" of puppies were not properly developed in cases where their mothers, expectant or nursing, were not properly supplied with the necessary vitamins.

(The term "milk teeth" is absurd—unless, indeed, we transfer it to the so-called "permanent teeth," which are being developed in a child in those early years when its diet contains much milk, and which are largely the actual products of that milk.)

UNUSED TEETH DECAY.—Most dentists, including Dr. Sim Wallace, and, I fancy, the large majority of those at the Conference, would regard as far more important than the foregoing, the other relation of our food and our teeth, namely, their direct relation in the mouth. If special reference has here been made to the relation of food to teeth after the absorption of the food, that is because of the new and significant discoveries which we owe to Mrs. Mellanby in particular. But Dr. Harry Campbell and Dr. James Wheatley, M.O.H. for Shropshire, who has done marvels in reducing dental disease by education in his county, are in essential agreement with Dr. Sim Wallace, whose interesting books on these topics are well known, that, when the utmost has been said for the tooth-brush as a cosmetic agent, which makes the teeth *look* clean, yet (in Dr. Wallace's words)—

"Dental Caries can only be prevented by physiological means. These are :—

"(1) Mechanical (the motions of the jaws, tongue, lips, and cheek) and the action of foods with certain physical qualities, e.g., fibrillar or spongy foods.

"(2) Chemico-physiological, resulting from the activities of the glands of oral hygiene (mucous and salivary).

"When the physiological activity of the muscles of mastication, tongue, etc., and the physiological activity of the glands of oral hygiene are not interfered with or stultified by unphysiological foods, especially at the end of or between meals, dental caries does not occur."

We need not trouble about the difference of opinion here implied between Mrs. Mellanby and Dr. Wallace. All her work may be valid and invaluable; and yet his contention may be true that our teeth decay because we do not use them properly. We see this happening to the brain (as of persons who nowadays can only "listen to" lectures consisting of lantern slides, and "read" papers consisting of pictures); and if it be not true of the teeth they are outside the general and vital law that what is not used declines, decays, disappears, dies.

FOOD REFORMERS IN CONFERENCE.¹

Manchester went on in its errors of eating and drinking on May 13th, 14th, and 15th, while a little company of food educationists conferred in the Albert Hall on the very important subject of the Prevention of Diseases of the Teeth. The thesis was that what we ate, how we ate it, and when we ate it, combine to determine the fate of the teeth, and consequently the fate of the individual and of the nation. Now, viewed in a broad and general way, this may be granted. Nothing can exceed the importance of suitable feeding. If the expectant mother—if the nursing mother is suitably fed—if the child from its birth receives food containing all the essential body-building factors—if the food is given at regular intervals—if proper methods of eating be taught and consistently enforced, in conjunction with effective means of cleansing the oral cavity—then we may confidently hope that in great measure the very shocking dental conditions so common among the mass of the people to-day will be avoided in the future. In so far as it said and emphasised these things, the conference did well, and nothing but good can come from its deliberations.

¹ Reprinted, by permission, from the *British Dental Journal*, June 1st, 1920.

THE CAUSE OF DENTAL CARIES.—All this, however, is very far from supporting the contention which was advanced, that dental caries has only one cause, that what are popularly known as strong and weak teeth do not exist, or that the microscopic structure of the teeth may not influence the rapidity of the destructive process. Modern dental thought and investigation turn rather with interest and with hope towards the very interesting contribution of Mrs. Mellanby, which suggests that by the means noted above the resisting power of the organ to the incidence of disease may be raised, and that “the part played by foodstuffs after absorption into the general circulation” may prove to be the more fundamental. Indeed, if this be not so, then surely the work at Maternity and Child Welfare centres has, for dentists, only a philosophic interest.

A NOTE ON THE TOOTHBRUSH.—Dentists appear to be divided into two groups, those who regard the toothbrush as unnecessary or even harmful, and those who think that it still has a sphere of usefulness. Among the arguments used by the first class are that it is relatively inefficient compared to the natural cleansing effect of mastication and other movements of the oral tissues; that it may readily become infected and so be a means of increasing dental disease rather than preventing it; and that it is responsible for wearing away the teeth and gums. On the last argument, that grooves in the teeth may be caused by a vigorous use of the toothbrush, combined with an abrasive powder, is likely, as Miller’s experiment showed; but short of such excessive use is there any evidence to show that the employment of the toothbrush *per se* actually destroys the free edge of the gum? The nature of the argument would appear to be that by friction the epithelium covering of the gum is destroyed and that the level of the gum recedes. Surely there is here a fallacy of reasoning and a misconception of the process whereby the epithelial covering of the body is normally preserved intact. The superficial layer of epithelium is being constantly cast off; proliferation of the deeper layers occurs, so that when the superficial scales are shed the layers underneath take their place and become keratinised; and so throughout life the process goes on. We see that the repara-

tive process is normally equal to a considerable amount of loss by friction, and that in those parts in which the wear is considerable, as on the fingers or the soles, there is an actual thickening of the epithelium. The argument of those who assert that the toothbrush wears away the gum would appear to be as follows : By its use the destruction of the superficial layer of epithelium is so increased that it exceeds the normal compensation in the shape of proliferation of the deeper layers, with the result that the amount of gum tissue is actually reduced. This obviously cannot mean that the epithelium alone is reduced, since this must imply that the sensitive and vascular layers of the corium would be exposed, and this, by the pain and hæmorrhage caused, would soon put an end to the use of the toothbrush. As a matter of fact, if inflammation be absent the gums can be scrubbed hard without causing either pain or bleeding. Since, in recession of the gum, alleged to be due to the toothbrush, the free edge is still covered by epithelium, we must assume that the shrinkage is in the connective tissue and not in the epithelium. If recession of the gum can be caused directly by the use of the toothbrush, why should not the finger-tips be shortened by excessive use, or the height reduced in people who go bare-footed ? It must be as reasonable to assume the one as the other.

ATTRACTIVE HEADLINES.—The attractive nature of dental items to the daily newspaper should teach our experts caution in their use of terms. A great deal of solid common sense was talked at the Conference, and much was said which, if reported, would have been of interest and of use to the public, but what did receive emphasis was—as perhaps might have been expected—that dry champagne and beer were effective mouth-washes, and that toothbrushes are probably a danger. Well, this may be all quite true, but there are much more important truths to be emphasised, and some of the prohibitionist members of the Conference were a little scandalised. On the whole, the Conference justified its existence, and the importance of dental treatment, both curative and preventive, was impressed on health workers from all parts of the country, and information was supplied to them which would undoubtedly aid them in their work,

while the names of the dentists contributing papers were a guarantee that this information was sound.

THE UNITED KINGDOM CONFERENCE ON THE PREVENTION OF DENTAL DISEASE.¹

The Food Education Society held a successful conference on the prevention of dental disease at Manchester on May 13th to 15th. Among the speakers were Dr. Sim Wallace, Dr. Harry Campbell, Messrs. Badcock, Holborn, W. H. Jones and Pitts. Mrs. Mellanby read a paper on vitamins and their relation to the development of the teeth and jaws in puppies, and Dr. Harold Waller described the pernicious results which oral sepsis in nursing mothers may have on the health of their babies. Dr. Wheatley gave some figures which seemed to show that in Shropshire dental caries has diminished during the war. The aim of the Conference was to interest those who are concerned one way and another with the health of the community, and there was a good attendance of nurses, teachers, school medical officers, as well as the general public. The subjects discussed were dealt with in a popular fashion, and for that reason did not add anything fresh to our knowledge of dental disease, but they were keenly discussed afterwards by the audience, who showed a sound appreciation of their bearing on the health of the community. Among those present was Dr. Saleeby, who joined in the discussion.

OUR NATIONAL DIETARY AND A TRANSATLANTIC CONTRAST.²

BY OUR MEDICAL CORRESPONDENT.

Four days' observation in the United States has abundantly sufficed to confirm the impression of immense dietary advantage which I formed in this country last year. In view of the recent work on vitamins, primarily of English origin, who can wonder at the absence of any signs of rickets from American streets, when he observes the diet of children and adults alike? In view especially of Mrs. Mellanby's recent work on the experimental feeding of puppies, with

¹ Reprinted, by permission, from the *British Dental Journal*, June 1st, 1920.

² Reprinted, by permission, from the *Observer*, September 26th, 1920.

subsequent comparison of their jaws and teeth, who can wonder at the manifest superiority of American teeth over ours? This is a matter primarily not of dentistry, but of dietary. The finest dentistry in the world, such as Americans undoubtedly enjoy, cannot create well-formed jaws and teeth. That is a question, first, of the dietary of development, and second, of the proper appreciation and care of the mouth and teeth.

This, of course, is the land of plenty. Despite the lack of an answer in America, as in Britain, to the question, "How yer gonna keep 'em, Down on the Farm, After they've seen Paree?" there is still a superabundance of innumerable varieties of fresh food produced on this vast continent, and in that production milk is second to none. Well-nigh the only physiological sin remaining in "dry" America is the tendency—at which who can wonder amid such delicious abundance?—to overeat. That is the temptation to which many adults of both sexes obviously succumb—though even here there are not quite so many fat people as in Denmark, with its superlative milk supply. But it is the children who matter most, for in them development is occurring, and that they should be generously and variously fed is all to the good. The quantity of ice-cream consumed at this time of year is fabulous; and for the physiologist this means an abundance of fat and "fat-soluble A," as the American investigators call it, or "anti-rachitic vitamine," in its most natural and palatable form. So much for the proper development of bones and teeth.

Observe, also, the large quantities of fresh fruit consumed by one and all. Everyone begins his breakfast with grapefruit, orange, canteloupe, and prunes. Throughout the day fruit is being consumed in conjunction with ice-cream, in long "soft" drinks and otherwise. I wonder how many American physicians have seen a case of scurvy, which must be about as common on this continent as beri-beri in England. Besides being rich in the "water-soluble C" or "anti-scorbutic vitamine," fruit in general contains very valuable salts, and usually also a good deal of sugar, which is consumed in large quantities in all its forms here. A medical writer in one of the New York papers is telling his readers that children should get a quart of milk (such splendid milk) every

day—on their breakfast cereals, as a beverage, with fruit, in puddings, and otherwise. Doubtless these are the best-fed children in the world ; no wonder that, when they grow up, they carry all before them at the Olympic Games ! I am not hereby judging by the kind of food served at the Commodore Hotel in New York, nor at a corresponding hotel in Buffalo, but by what I have seen and eaten in tiny places at Niagara Falls, and in a rural village far from anywhere. The prices vary immensely, but the physiological essentials of the fare are similarly admirable in all these cases.

I am more than ever dissatisfied with our national dietary in Great Britain, and decline to admit for a moment that, despite our obvious disadvantages, it is not capable of almost unlimited amelioration. If not——.

OUR NATIONAL DIETARY.¹

The verdict passed by your distinguished medical correspondent upon our national dietary, as contrasted with that obtaining in the United States, is not surprising. A layman, but an acute observer, remarked to me some years ago that what specially impressed him was the greater variety of foods placed before one in the average American restaurant. Such freedom of choice increases the probability of a well-balanced diet being within the reach of all, which cannot be said of conditions here. Your correspondent will be gratified to learn that the report of the Manchester conference on the prevention of diseases of the teeth, to which he looked forward with such keen interest, is in an advanced state of preparation. It will contain the paper by Mrs. Mellanby, to which he alludes in his article.

By way of postscript, I might add that the “splendid milk” of New York referred to is graded and sold at varying prices, according to the quality. Under the Milk and Dairies Act, 1914, such “certified milk” may be sold in this country.

CHAS. E. HECHT,

Hon. Secretary, Food Education Society.

Danes Inn House,
265, Strand, W.C.2.

¹ Reprinted, by permission, from the *Observer*, October 10th, 1920.

SOME IMPRESSIONS OF THE CONFERENCE.

[It is always interesting and instructive to learn how the same facts strike those approaching them from various points of view. Here we are able to contrast the verdicts of the doctor and social worker with those of the dentist and welfare official, and physical culturist.—Ed.]

NOTES ON THREE PAPERS READ AT THE MANCHESTER CONFERENCE ON THE PREVENTION OF DISEASES OF THE TEETH, MAY 13TH, 1920.

By DR. MARION COCKERELL, MEDICAL OFFICER, ARGYLE SQUARE, KING'S CROSS, INFANT WELFARE CENTRE.

A LOGICAL SEQUENCE.—There was a small attendance at the Conference held at Manchester by the Food Education Society on the subject of the prevention of diseases of the teeth, considering the importance of the subject and the authority of many of the speakers. The first three speakers were in remarkable harmony, and their papers formed a logical sequence, which presented a hopeful picture of the possibility of preventing dental caries.

CAUSE OF CARIES.—DR. HARRY CAMPBELL described the shameful prevalence of caries in this country and its dire results. Its cause he traced to errors in our diet and dwelt mostly on the soft character of our food. The infant, craving something to bite upon when its teeth appear, is given a little starchy addition to its milk, and this is gradually thickened as if to teach it to bolt its starch in thicker and thicker form. It should, of course, receive foods requiring mastication. This is also the only way to teach children to masticate.

GYMNASTICS OF MASTICATION.—The gymnastics of mastication are most valuable. They develop the various muscles concerned and the bones to which they are attached. They rock the teeth in their sockets, and increase the flow of blood and lymph through these sockets, tending to the nourishment and due growth of alveolar arches. The net result is properly developed jaws, with provision for the proper spacing of teeth, so as to produce regular and symmetrical

dental arches. Mastication also promotes salivation and secures a fine division of the food and its mixture with saliva so as to pass it on to the stomach in the form best fitted for digestion.

CLEANSING THE MOUTH.—DR. SIM WALLACE concerned himself mostly with the physiological cleansing of the mouth. Since all caries starts with the deposit of carbohydrate on and between the teeth, and its conversion by bacterial action into acid which acts upon the lime salts of the teeth, it is essential that no such deposit should be left. The toothbrush has been found to be ineffectual to remove this deposit and has its own dangers, so that reliance can no longer be placed upon it. A reasonable diet is the proper preventative. This diet is one which calls for sufficient mastication and which provides for the finishing of a meal with cleansing food. The movements of tongue, cheek, and lips are of a cleansing nature, that flushes the mouth with saliva. The mechanical action of saliva is to wash away débris. Chemically its ptyalin acts upon any starchy food left behind and converts it into a soluble form, and its alkali neutralises the acid formed by micro-organisms from starchy food. The cleansing foods which should end a meal are those of a fibrous nature, and include fresh fruit (especially the apple), salads, raw vegetables, meat, fish, and cheese. Drinks such as water, tea, coffee, etc., are also cleansing.

SWEETS AS A LEADING FACTOR.—DR. JAMES WHEATLEY made a valuable contribution in the form of actual statistics. The school inspections in Shropshire show a definite relation between the amount of sweets eaten by school children and the amount of caries present in their teeth, the relation being that of direct proportion, from which he infers that "the eating of sweets is a cause of dental caries."

Perhaps an even more significant series of figures was that comparing the teeth of children entering school at five years old in 1913, and again 1919-20. In 1913 only 5 per cent. of these were without carious teeth, but in 1919-20 there were 44 per cent. without carious teeth. Corresponding figures for the twelve-year-olds were 2·9 and 27·1.

EFFECT OF WAR-TIME DIET.—This decrease he thinks may be due to:—

1. Restriction and modification of food during the war, *e.g.*, sugar has increased very much in price, and its consumption has been halved. Bread had offal added, and the extraction of grain rose from 68 per cent. to 80 per cent. New bread was not sold, and crusts were eaten and not thrown away. There was a diminished consumption of milk.

2. Energetic education campaign by health visitors, medical officers, teachers, etc., in the country. In this connection it may be mentioned that Dr. Wheatley in 1913 drew up a leaflet for distribution on the prevention of decay of teeth, advising such a diet as Dr. Harry Campbell and Dr. Sim Wallace suggest.

The net result, from whatever cause, is striking. The eating of sweets, especially between meals, destroys the teeth. Is there anything to be said for the practice? It is generally admitted to be bad for the digestion as well as the teeth, so that on health grounds sweets between meals should go. They will not probably go all at once, because children love them, and parents are indulgent or lacking in control.

SUGAR AND SWEETS.—Sweet things eaten at meals are not so injurious, unless they end a meal. They are probably not necessary, though they are nice. It has been said for them that they are fattening, but in infancy the fat-forming sweet foods are usually distrusted, as not tending towards good nutrition and disease resistance. Probably the same is true for older children, and experience shows that they suffer from lack of fat and proteid rather than from lack of sugar.

As far as food requiring mastication and the cleansing foods are concerned, some are at hand in the form of crust of bread, salads, and fruits, while others such as baked bread, fish, and meat are easily prepared.

From prophecies in the papers it is likely that a more wholesome bread may be forced upon us, so let us bear that and the scarcity of sugar with a cheerful fortitude, since it may allow the coming generation to grow up with better teeth than most adults can show.

A PLEA FOR DIET REFORM.—The arguments for certain alterations in our diet seem conclusive. With most of us

the reason why we do not at once adopt the regime suggested will be the fear of joining the ranks of the food faddists, who seem to let the matter of diet and food values absorb too much attention, and who bore everyone who sits down to meals with them by dissertations on wrong and right methods of feeding.

To be deterred by such considerations would be cowardly (though one confesses to some sympathy with such cowardice), in the case of those who have children to cater for. The rules are simple, easily absorbed, and their reason can be made clear to any but the youngest child. The result aimed at is big enough to take much trouble about, when one considers the unnecessary disability, suffering, and serious illness caused by dental disease.

VITAMINE X AND OUR TEETH.¹

REPORTED BY GWENDOLEN BRUCE.

At the Conference on the Prevention of Diseases of the Teeth, held in Manchester May 13th, 14th, and 15th, very interesting papers showing the vital connection between diet, mastication, disease and growth were given by well-known people.

A HUMILIATING CONTRAST.—COLONEL ADAMI, Vice-Chancellor of Liverpool University, compared the teeth of the ordinary Englishman with the teeth of the Canadian or American, very much to the latter's advantage. The Englishman's phlegmatic nature and indifference to pain might account in some way for this neglect of the teeth, but we are a generation behind the U.S.A. or Canada in this matter. The shortage and poor standing of the dentist in this country is largely due to the bad Dental Act of 1878, which left it possible for unqualified dentists to practise. There are only enough qualified dentists to attend to the middle and upper classes, which leaves the mass of the people neglected, or treated by unqualified men. In Bolton, for instance, there are three qualified and eighty unqualified dentists.

EXTENT AND CONSEQUENCE OF DISEASE.—DR. HARRY CAMPBELL spoke on the extent and consequences of dental diseases, and

¹ Reprinted, by permission, from the *Journal of Scientific Physical Training*, Summer, 1920.

showed by numbers given that diseases of the teeth are practically universal amongst us and a real national disgrace. Great emphasis was laid on the fact that nine-tenths of the disease is preventable. Among the consequences of dental disease, stress was laid on the blood-poisoning which results in rheumatoid arthritis and neuritis, which are so common amongst us to-day.

TWO SCHOOLS OF THOUGHT?—As the Conference progressed, it appeared that there were two distinct schools of thought regarding the cause or causes of dental caries: one led by Dr. Sim Wallace, smaller in number, and—as appeared to me—men of the older school of thought, the other led by Mrs. May Mellanby, which seemed the younger and more progressive party. These differences of opinion led to most interesting discussions. DR. SIM WALLACE maintains that the *sole cause* of dental caries is the action of acid, formed by bacteria from carbohydrate foodstuffs which find lodgment in the crevices of the teeth, and between them. It has practically nothing to do with the inside condition of the teeth, as the decay commences where the carbohydrate foodstuffs accumulate. Inequalities of the teeth encourage this accumulation. What is needed to prevent this accumulation is the eating of hard cleansing foods and proper mastication. The real physiological function of the mucous and salivary glands is not to aid in digestion (the amount digested in the mouth is infinitesimal), but to wash and keep the mouth clean.

Mastication influences the flow, strengthens the teeth and increases the blood supply to the roots and gums, and, combined with the movements of lips and cheek, etc., washes away the debris and keeps the mouth clean. The soft starchy foods that we eat, and our way of cooking, make proper mastication impossible, and this self-cleansing process is hindered. Dental caries is as much a dirt disease as many of the skin diseases, since it is due to matter remaining where it should not be. Mastication is not the up-and-down movement of the lower jaw against the upper, but a real grinding, up-and-down, side-to-side movement. In conclusion, Dr. Wallace suggests that the diet of the nation should be radically altered, certain foods and modes of cooking being restricted, or that the choice of foods be left free, so long as

certain cleansing foods (especially fruit) terminate each meal, leaving the mouth physiologically clean.

THE PART OF VITAMINE X.—MRS. MAY MELLANBY, on the other hand, considers that the inside condition of the teeth does play an important part, and that there may be other factors responsible for the poor structure of the teeth, and for their liability to decay. These factors are dietetic, and she thought that the part played by the food after absorption into the general circulation was more important than the part played in the mouth. In addition to the four fundamental units needed for a mixed diet (proteids, carbohydrates, fats and salts) some "accessory" food factors are necessary. One factor particularly, which Mrs. Mellanby called *Vitamine X*, is of primary importance in the normal development, calcification and spacing of the teeth. Lack of the antiscorbutic vitamine is well known as the cause of scurvy, and, possibly, rickets is caused by lack of these factors also. It is common to find a diet in which Vitamine X is deficient, for it is, on the whole, associated with expensive articles of diet—eggs, butter, whole-milk and animal fats. The importance of the presence of this factor is probably greatest during the period of rapid growth, *i.e.*, from first few weeks of ante-natal life till the second year; it is, however, required for healthy living as well as growth. In experimenting with puppies 5–9 weeks old, Mrs. Mellanby had divided the batches into two, and given both the same *basal diet* containing every necessary element except Vitamine X. The housing, exercise, and other conditions were the same for both batches.

A. One batch of puppies was given, in addition to the basal diet, either codliver oil, whole-milk or other animal fats (except lard) containing Vitamine X. They developed normal teeth and jawbones.

B. The other batch was given, in addition to the same basal diet, linseed oil, separated milk, or vegetable fats, etc., lacking in Vitamine X; as a result, the puppies showed all or some of the following defects:—(1) jawbones soft, composed largely of osteoid tissue; (2) teeth irregularly arranged; (3) eruption delayed; (4) enamel defective; (5) dentine poorly formed and deficient; (6) calcium content of teeth compared to size, low; (7) diminished resistance to disease.

Other experiments on pregnant and lactating bitches indicated the importance of Vitamine X in the mother's diet for the formation of normal deciduous teeth. Mrs. Mellanby said her deductions might be wrong, but the facts remained to be accounted for.

DIET AND REGULARITY.—MR. BADCOCK, speaking on the importance of having regular teeth, showed that mechanical factors as well as dietetic factors were responsible. (1) Normally a new tooth was guided into position by a tooth on each side of it, the tongue behind and the cheek in front; the 6-year molar erupted first beside the last temporary molar. If the latter was lost the 6-year molar, instead of erupting in its right place, erupts in the space left by the temporary molar, and each tooth in turn is pushed out of place; overcrowding results, and one tooth must usually erupt through the gum. This happens when any milk-tooth is lost too soon. (2) On the other hand, milk-teeth were sometimes kept too long, often owing to decay or lack of mastication which should remove the loosened tooth at the right time; the permanent tooth had to erupt out of its right position, resulting, again, in irregularities and overcrowding. (3) Mouth-breathing also caused irregularities.

SWEETS AND CARIES.—DR. WHEATLEY considers that sweet-eating is largely to blame for the universality of dental caries. A century ago caries was not so prevalent as it is to-day, and it is in the past century that the eating of sugary things and sweets has become so excessive. As a result of war conditions and restrictions on sugar and bread, we should expect to find a change in the teeth of children born between 1915-20. During this period (a) *Sugar* confectionery, sweets, and jam were scarce and expensive, the consumption of sugar being halved. (b) Bread was not sold new, more offal was added to the flour, and crusts were eaten.

Sweets and manufactured foods are: (1) Very concentrated and inferior to natural foods; (2) constantly eaten during the day and last thing at night; (3) require no vigorous mastication, sticky and soft, and leave the mouth dirty. To support these suppositions it was evidenced that in the county of Shropshire, 1911-14, only 4 per cent. of the school-children were free from dental caries: 1915-20, a very

remarkable decrease of caries was shown, 70-80 per cent. of the children being free from it. Strenuous educational propaganda might be partially responsible, but if these facts were confirmed by other statistics they would constitute valuable proof.

Other papers on the care of the milk-teeth and the teeth of the expectant and nursing mother were read.

PYORRHOEA—AND THE TOOTHBRUSH.—In his paper on pyorrhœa, a disease of the membrane which holds the tooth in its socket, Mr. Holborn strongly condemned the usual method of tooth-brushing (up and down and side to side) as causing absorption round the gums and between the teeth. Insoluble tooth pastes and powders only make matters worse. Brushing merely removes part of the dirt and stains, but not enough ; it also takes away some of the enamel, and causes inflammation. If brushing must be done, children should be trained to keep the mouth wide open and brush the upper and lower jaws separately, and with a movement away from the gum. In his opinion, nature never intended the teeth to be brushed ; civilised man was the only species that did so. He imagined we should brush our stomachs if we could. Mastication and hard fibrous foodstuffs were the natural cleansers.

NEED FOR EDUCATION.—In the two papers given on preventive and educational methods it was shown that, as the problem centred round food and diet, widespread propaganda was needed among all classes. The Food Education Society is trying to do more to educate the masses as regards diet, cooking, etc., but it is only by education plus regular dental inspection that we can hope to improve the nation's teeth.

THE TEETH AND HEALTH.¹

THE FINDINGS OF A CONFERENCE.

By T. P. W. WATT, L.D.S. (Edin.)—*Senior Works Dentist, Messrs. Cadbury.*

Representing the Firm and the Dental Department at Bournville, I attended the Dental Conference held in Manchester on May 13th, 14th, and 15th last.

¹ Reprinted, by permission, from *Bournville Works Magazine*, August, 1920.

In view of the appalling revelations published by the authorities in connection with the medical and dental inspection of Army recruits during the war, it behoves all to consider carefully this matter of the condition of the teeth of the manhood of the nation, and to regard the means for the prevention of diseases of the teeth. I welcomed the opportunity of hearing the views of the many eminent people billed to speak, and of taking part in a conference which it is hoped will give a strong lead to sanitarians, to educational bodies, and also to employers of labour on this important question.

The proceedings were opened by Sybil, Viscountess Rhondda, and during three days eleven papers were read and discussed. The general conclusions of the Conference may be summarised from my notes in the following form :—

SAVE THE TEETH.

Some Whys and Hows.

(1) Dental diseases are to a very large extent preventable, but once started are incurable (that is, in the sense that tooth tissues once lost through decay will not grow again. We can only remedy such a defect by filling, crowning, etc., or, if these are impossible, by extraction and substitution of an artificial tooth).

(2) Preventive measures should commence with attention to the health, diet, and general surroundings of the expectant mother. A large amount of good work is now being done in this direction by the "Maternity and Infant Welfare Centres."

(3) Nursing mothers require the same amount of care. Bad and suppurating teeth in a mother were shown to have virtually poisoned her infant. The removal of the bad teeth immediately produced an improvement in the infant's condition.

(4) As soon as a child has teeth he should be encouraged to use them, and not be fed on slops. The jaws require exercise to develop normally. This ensures that the "milk" teeth come in in their proper positions, and such complaints as "adenoids" are largely prevented. Crusts, twice-baked bread, salads and uncooked fruit (apples especially) should form a large part of the diet. In fact, any ordinary food which requires plenty of mastication is what is wanted.

(5) Care of the "milk" teeth is important. They should be kept under efficient dental supervision from the time of their first appearance. Should decay commence it should be properly treated. The second or permanent teeth depend very largely on the "milk" teeth for guidance into their correct positions.

(6) All teeth, whether temporary ("milk") or permanent, should be kept clean—preferably by suitable diet—*i.e.*, by finishing each meal with hard or fibrous food (crusts, salads, apples—in fact, anything that requires chewing and tends to promote a free flow of saliva so as to clean off any soft or sticky food which may have lodged about the teeth). This is Nature's method. Should this, however, be impossible the artificial aid of the tooth-brush must be employed immediately after the meal. All children should be taught to keep their teeth clean either by "natural" or "artificial" means. If the teaching is persisted in they will acquire the habit of oral cleanliness, and will hate the feeling of having foreign matter clinging to their teeth. If it is impossible to brush the teeth after each meal, swilling out the mouth with water will help, but in this case the teeth should be very thoroughly cleaned just before retiring to bed.

(7) The bad habit of eating between meals should be strongly discouraged, as this is a fruitful source of decay of teeth, as well as of digestive trouble. Interesting figures were quoted from one county showing the improvement in the teeth of children born just prior to the war compared with those born five or six years previously, and all examined at the age of five years. The improvement was attributable to the fact that white bread was unobtainable, crusts had to be eaten (previously they were thrown away), the war bread was coarser, new bread could not be bought, and sweets and biscuits were consumed in much smaller quantities.

It is expected that the full report of the Conference will be published in the autumn.

QUESTIONS IN PARLIAMENT.

I. GRAVE.—"Have you seen," wrote Miss May Yates, hon. secretary, Bread and Food Reform League, "that a question was asked in the House of Commons as to the connection between bread and dental caries, based upon the information

which Dr. Wheatley and myself gave at your very successful Conference ? ”

The question referred to was put on May 20th, 1920, in the following terms :—

“ Mr. Haslam asked the Minister of Health whether his attention had been called to the statistics recorded by Dr. James Wheatley, county and school medical officer for Shropshire, that since the war there had been a very pronounced decrease in the number of children suffering from decayed teeth, the average percentage of children with teeth free from decay at the age of five being recorded as 5 per cent. during the years 1910 to 1914 inclusive, and 44 per cent. during the last six months at the age of twelve, the figures being 2·9 and 27·1 respectively ; whether he is aware that the opinion has been expressed that this improvement in the condition of the teeth of the children is due to the modifications of the food supply during the war and especially to the extraction of wheat for use in bread being increased from about 68 per cent. to 80 per cent. and also to the lessened consumption of sugar ; whether he is aware that in those countries where the principal food of the people consists of cereals of high extraction, such as in the northern provinces of India, decay of the teeth is rarely met with ; and, considering the national importance of this subject, will he take the measures necessary for its close investigation by his Department.”

DR. ADDISON : “ My attention has been drawn to the statement referred to, and the subject of dental caries and its prevention is receiving the careful consideration of my medical advisers.”

2. GAY.—Within a few days of the Conference, May 16th, the following question was addressed to Mr. Austen Chamberlain, M.P., by the late member for the Wrekin Division of Shropshire.

“ Mr. Palmer asked the Chancellor of the Exchequer whether his attention had been called to a speech at Manchester by Dr. Sim Wallace, late lecturer on dental surgery and pathology at the London Hospital, declaring that while cocoa and chocolate were not beverages for cleansing the mouth, tea, coffee, and beer were, and that dry champagne was an excellent mouth-wash ; and whether, in the interests

of public health, he would reconsider his excise proposals affecting beer and champagne, with a view to reduction in duties."

MR. A. CHAMBERLAIN: "The answer to both parts of the question is in the negative."

PREVENTION OF DENTAL CARIES, AND THE DESIRABILITY OF GOVERNMENT INVESTIGATION.¹

By JAMES WHEATLEY, M.D., COUNTY MEDICAL OFFICER AND SCHOOL MEDICAL OFFICER FOR SHROPSHIRE.

[As Dr. Wheatley's Birmingham paper in some respects supplements that read by him at Manchester six weeks earlier, portions are here, by permission of the author, included. For the selection he has no responsibility. It is an additional satisfaction to give the resulting discussion, since two of the speakers, Dr. John Robertson, medical officer, and Dr. G. A. Auden, school medical officer, respectively, for Birmingham, were unfortunately, like others specially interested, unable to respond to the invitation to take part in the proceedings at our Conference. Mr. Clayton Cooper, another absentee, was one of the appointed representatives of the Midland branch of the British Dental Association.—Ed.]

AN EXPLANATION.—It is a presumption for a medical practitioner to address a meeting of specialists on their own subject. I have, however, a certain amount of justification, for my work is prevention of disease, whilst you are primarily concerned with its cure and the prevention of its further progress. For the last ten or twelve years I have, moreover, been engaged in inquiries, principally statistical, into the cause of dental caries, and have carried out schemes of prevention mostly based on the teaching of Dr. Sim Wallace. Within the past few weeks I have published figures on the incidence of caries in the county of Salop which, if correct, prove to my mind conclusively the preponderating effect of food in its causation and prevention. These are my excuses for my audacity, and you

¹ Extracts from a paper read before the Central Counties Branch of the British Dental Association, June 26th, 1920.

will, I hope, forgive me if at any time I appear to forget that I am a general medical practitioner addressing a meeting of specialists. My object is essentially a practical one. I see the fearful amount of illness and inefficiency that this condition is causing, and feel that no time should be lost in using the knowledge we already possess for its prevention and in urging further investigation.

LARGE MEASURE OF AGREEMENT.—The first steps should be to ascertain what are the causes of dental caries that we are mostly agreed upon, and to see whether a scheme of prevention cannot be based upon them. Differences of opinion, particularly upon minor matters, there will always be. Unfortunately, it has often been the practice to concentrate on these and to suggest that no effective action can be taken until they have been explained. What would have been our position now if we had waited until the organisms of tuberculosis, typhoid fever, or cholera had been discovered before taking active measures for their prevention? The battle had been more than half won before we knew anything of them. Yet we have more exact knowledge of the cause of dental caries than we have even now of that of any of these diseases. There is fairly general agreement that:—

1. Decay of teeth, in its initial stages, is caused by acid decomposition of carbohydrate food in contact with the teeth and in no other way.

2. Vigorous exercise of the jaws is necessary for their proper development, and consequently for the regular arrangement of the teeth.

3. Mastication and a good flow of *normal* saliva are essential for the proper cleaning of the teeth, or neutralisation of the acid formed.

4. Illness during the formative period of the teeth may lead to maldevelopment and predispose to decay.

5. Although not yet absolutely proved, there is reason to believe that the development of the jaws and the enamel of the teeth is, to some extent, dependent upon the presence in the food of the fat soluble A vitamine, or an associated vitamine.

There are differences of opinion as to the relative importance of these various factors, and a feeling amongst many dentists

and medical men that this is not the whole truth, but that there are also constitutional factors influencing the production of dental caries.

The composition of the saliva is thought by some to be an important determining factor, and it is suggested that, in normal health, lime salts are deposited in the enamel from the saliva throughout life. Dental caries has even been attributed to derangement of the functions of the ductless glands, particularly the thyroid interfering with calcium metabolism.

CAUSES OF CARIES.—Let us examine the causes of dental caries previously stated, and see how far they are essentially due to the character of the food.

1. Decay of teeth in its initial stages is caused by acid decomposition of carbohydrate food in contact with the teeth and in no other way. This cause is obviously dependent upon some character of the food determining its lodgment and acid fermentation.

2. Vigorous exercise of the jaws is necessary for their proper development, and consequently for the regular arrangement of the teeth. Mastication must depend upon the character of the food and the absence of drink at meals.

3. Mastication and a good flow of normal saliva are essential for the proper cleaning of the teeth, or neutralisation of the acid formed." Here the point of dispute appears to be whether the composition of the saliva, or its amount and the completeness with which it is forced into every crevice, is the important factor. Dr. Sim Wallace thinks that the essential is the tough fibrous character of the food and Dr. Pickerill that it is its acidity or sapidity.

FOOD THE PRINCIPAL FACTOR.—This difference of opinion is no obstacle to formulating schemes of prevention. Tough fibrous foods are undoubtedly essential for developing the jaws and most of the "cleansing" foods are acid and stimulate the flow of saliva. The exact effect of the salivary secretions in the prevention of caries may yet require considerable elucidation, but we may rest confident that the principal factor affecting the functional activity of these glands is food, and that if they are given their normal stimulation by means of natural food having the necessary "relish"

or "sapidity" and requiring vigorous mastication they will, in the ordinary healthy person, secrete a normal saliva. On the other hand, they can hardly be expected to do so if the stimulus of natural food and mastication is withdrawn.

If some alteration in the quality of the saliva is the principal cause of caries, this alteration must take place in about 99 per cent. of the people (more than this percentage suffers from dental caries) and consequently must be due to a universally defective environment intimately associated with the nutrition of the salivary glands. What other defective environment except that of food can be suggested?

It does not help matters to put the fault further back on to the ductless glands, because we should still require a universally defective environment, this time acting on them. It has been suggested that mental excitement and over-training is such a cause, operating through the ductless glands and upsetting the calcium metabolism. In the county of Salop the country children have almost as bad teeth as the town children, and those entering school at the age of five averaged, before the war, 6 decayed teeth per child.

4. Illness during the formative period of the teeth may lead to bad development and predispose to decay.

It is probable that only a small proportion of the enormous amount of caries is due to such maldevelopment, and obviously this cause cannot be considered in any scheme of prevention, except by directing that attention should be paid to the condition of the mouth in these early diseases.

FAT SOLUBLE A.—The development of the jaws and enamel is, to some extent, dependent on the presence of the fat soluble A vitamine, or an associated vitamine, in the food. This, again, is a question of food, although a different quality and acting in a different way. The distribution of rickets and dental caries leads one to think that this cause is not an important one, but we are taking no risk and are acting on the assumption that children should have sufficient of this vitamine for the prevention of rickets, quite apart from dental caries.

WHEN THE SAVAGE DEVELOPS CARIES.—It may safely be said that these defects of development, although important, are

not the principal causes. The development of caries in the excellent teeth of the savage, when brought under civilised conditions, after reaching adult life, shows that caries under certain conditions will arise in the most perfectly developed teeth. All experience points in the same direction.

Although, therefore, there are considerable differences of opinion with regard to the relative importance of various causes and the manner in which they act, there is strong ground for thinking that the causation of dental caries is dependent on food. This is confirmed in a striking manner by the medical inspection of children before and after the war in the county of Salop.

ILL-HEALTH AS A FACTOR.—Many dentists find some difficulty in accepting completely the theory of food causation, and think that caries is often due partly or wholly to a constitutional cause. It is obvious that this may operate through a loss of appetite, alteration of character of food eaten, or possibly through alteration of saliva, but is there any real reason to think that ill-health is a considerable factor in the great prevalence of dental caries ?

WHAT AN EXAMINATION REVEALED.—In 121 consecutive women, examined for nursing scholarships, the average number of teeth decayed or lost was 17·7. These women were mostly between 25 and 35 years of age, and had had the ordinary average health of persons of their class. It was quite impossible to attribute the horrible condition of their teeth to any constitutional illness.

The prevalence of caries at an early age with a decrease later in life, or the prevalence during pregnancy, or after an illness, is often brought forward as a reason for assuming that caries is due to a constitutional cause. These facts, where they are facts, are capable of quite another explanation.

WHY EARLY DECAY IS SO COMMON.—Is not the greater prevalence of decay in childhood and at an early age exactly what one would expect on the theory that decay is due to food ? There is in that period the excess of milk and sweets, a sloppy diet, frequent meals, and often a glass of milk and a biscuit or a sweet on going to bed. Where these conditions are absent, there is no excess decay. Again, with

regard to the permanent teeth, in any given mouth, there must be certain teeth which from their shape, position, structure, or other quality are particularly liable to decay. When these have decayed and been dealt with, we naturally have a slowing down of the process. There is no necessity to assume any constitutional change.

CARIES IN PREGNANCY.—I cannot find that the supposed increase of caries during pregnancy rests upon any conclusive observations. It probably originates from the fact that caries is extremely prevalent in early adult life, and perhaps more especially amongst women, and that special attention is called to the condition during the examination of the mouth on account of pregnancy or illness. It would not be surprising if there was an increase in those pregnant women who take large quantities of milk. The young women previously quoted were nearly all unmarried.

MILK DIET AND THE SEQUEL.—There is an explanation other than that of change of constitution which may be applicable to causes of increased caries following acute illness. On more than one occasion I have been addressed as follows: "Oh, but I had good teeth until I had an attack of typhoid fever. My constitution then changed, and during the next year or two I lost my teeth rapidly." This and similar cases have the following simple explanation. In a severe attack of typhoid fever the patient used to be fed for a prolonged period, sometimes two or three months, almost entirely on milk. During the acute stage the mouth was generally open, the tongue dry and motionless, and little or no saliva secreted. There is probably no food, under such conditions, more liable than milk to stick in the crevices of the teeth and produce lactic acid quickly. During these two months caries, no doubt, begins in those teeth which, from their shape and arrangement, are most liable to attack, and the result is the formation of cavities recognised six, twelve, eighteen months, or two years afterwards. There is no necessity to suppose any change of constitution, and inquiry in my cases did not show such change in other respects.

Is there any evidence that after the development of the teeth is complete the constitution has any effect in producing caries, except so far as it acts in influencing local

conditions, such as the flow and quality of the saliva, the state of the gums and mouth generally, the appetite and its effect on food and mastication? I have never heard of such evidence, nor can I see how constitution can have any effect upon a dead substance like enamel.

A DIETETIC PROBLEM.—I would strongly urge, therefore, that the problem before us is entirely a dietetic one, whether our object is primarily to prevent rickets and consequent jaw malformation, to secure good development of jaws and arrangement of teeth by mastication, to prevent food sticking to the teeth, or to get a good flow of normal saliva. If this is granted our course is clear. We must find out what are the essentials of such a diet, how they can be obtained with least disturbance to pleasures and convenience, and then study the means by which the public can be influenced so as to modify their diet.

PREVENTION.

A HOPEFUL OUTLOOK.—I am not one of those who think that it is hopeless to expect any great changes in the diet of the people, for already great changes of a similar kind have been brought about, *e.g.*, the alteration that is taking place in the feeding of young children and the practical disappearance of the disgusting habit of spitting in rooms, public conveyances, and similar places. We must, however, present a united front. It is essential that dental and medical practitioners and the Ministry of Health shall recognise the supreme importance of this matter and take every opportunity of educating the public. As there is not agreement on all points, although the points of disagreement have been far too much accentuated, the Ministry should be urged to place the cause and prevention of dental caries in the forefront of their scheme of research work in order to clear up points of doubt and so be in a position to direct a national campaign.

THE SPHERE OF LEGISLATION.—I urge even more strongly that we should not wait for Government investigation and action, but should utilise the knowledge already possessed. A scheme must necessarily be principally an educational scheme, but it is conceivable that some of the objects may be attained

by legislation. Food legislation has hitherto been restricted to the prevention of adulteration or of an article being sold under a wrong description. This limitation is no doubt due to the fact that there has been no clear evidence that the health of the public has suffered from the defects of our food supply. In Japan I should imagine that legislation has been necessary to prevent the over-polishing of rice; and in this country, if the over-refinement of bread is shown to deprive the population of something vital to health and not readily obtainable by the mass of the people in sufficient quantity from any other source, then legislation to remedy this will, sooner or later, come about here. Thus, if it can be shown that sugar, in the enormous quantities that we consume it, is injurious to health by causing dental caries and in other ways, its restriction, either by taxation or some other method, will be effected. Powerful trade interests will have to be overcome, and no Government will be strong enough except one that recognises the health of its people as its first object.

EDUCATIONAL METHODS.—When, however, legislation has given every help in its power, the principal work in the prevention of dental caries will still be educational. Our present means of educating the public on health matters, although improving, are still defective. The time will, no doubt, come when the prevention of disease will take its proper place in the training of every medical man and when the great body of medical practitioners will be paid, and I hope well paid, for duties in connection with the prevention of disease.

Then the education of the public on health matters will be comparatively easy. Our problem at present is to make the best use of the material at our disposal, formulate some simple teaching based on present knowledge, and utilise every available educational facility.

RULES FOR THE PUBLIC.—In my county I have condensed our existing knowledge into a few simple rules for the guidance of the public. I ask you to consider if there is anything you cannot accept, or anything contrary to physiological living. It is probable that they do not embody the whole truth, but most will agree that they deal with essentials.

1. As soon as an infant needs food other than milk (eight to nine months) give it in a solid hard form requiring mastication, such as crusty bread, twice-baked bread, or crisp toast. In this way good teeth are likely to grow, and good habits of mastication will be formed. *Never give bread soaked in milk, or flour added to milk, or other soft starchy foods* (such as most patent foods).

2. As the child grows up you should still give most of the food in a hard form, compelling mastication. Food should rarely be taken in a liquid form, or soaked in liquid, or minced. Bread should not be eaten new, and it should have plenty of good firm crust.

3. Drinking between mouthfuls is very injurious. Liquids should only be taken at the end of a meal or between meals.

4. *Sweets should never be taken between meals, nor the last food in a meal*; but only along with food requiring mastication.

5. *A meal should always be finished with a cleansing food* (see below). It is very desirable that fresh fruit should be eaten freely, particularly at the end of a meal. This is most important with regard to the last meal of the day.

6. Mouth breathing in children should always be corrected, and if obstinate medical advice should be obtained.

FRAMING A SCHEME.—If such teaching is the way to prevent dental caries and improve the development of the jaws and teeth, the next step is to devise a scheme for influencing the people in this direction. Whom can we rely upon, and what is the special rôle of each class of workers? Dentists are, unfortunately, so few in number and so overworked in the treatment of disease that little can be expected from them beyond research, direction, and approval of the work of prevention. There will, no doubt, come a time when everyone will be under dental supervision, and dentists will then have a paramount influence on the education of the public. In the meantime, approval of this work by the dental profession is essential to its complete success. Upon the public health medical service, and on both medical officers of health and school medical officers, depends the organisation of schemes. In carrying out these it has great armies of health visitors, school nurses, district nurses, and school teachers.

THE WORK OF HEALTH VISITORS.—Although teaching in the schools is valuable, teaching of the principles of healthy living, particularly of the proper upbringing of children, will have to be done, principally by health visitors, in the homes. For this purpose women are needed with a good general education and sufficient scientific knowledge to understand the physiological basis of the laws of health. Upon this can be grafted the special training required. In the county of Salop health visitors are instructed to look upon the prevention of decay of teeth as one of their principal duties. As soon as the child is about seven months old they begin to teach the mothers, and for the next five years it is, above everything else, the point on which most stress is laid.

THE TEACHER'S PART.—School teachers can do much to sow the seeds of this knowledge in the minds of the older children, not by formal lessons, but if their teaching particularly is made part of the everyday life of the child. I was much struck by the method of one schoolmaster. I had been explaining that in my opinion the rule not to drink at meal times was probably the most important in the prevention of dental caries. I asked him if he could teach the children this, and his answer was: "Oh, yes. I lock up the pump during lunch time, explain the reason, then unlock it and send the children out to drink." Methods of this kind have some chance of success where formal lessons inevitably fail.

HOW TO QUICKEN THE PACE.—Although progress has been slow, I am extremely optimistic as to the future of this educational work. There will come a time when it will be recognised that dental caries in children is mostly due to the neglect of the parents, and that it is a disgrace to have a mouth full of decayed teeth or false teeth. When such a time arrives, and I don't think it will be long, everything will be easy.

PLEA FOR A NATIONAL POLICY.—In conclusion, may I say a few words as to the position that the work of prevention of caries should take in the efforts that the Government are, presumably, about to make to improve health and physical efficiency—in modern jargon, to create an A1 nation in place of a C3 nation?

The importance of this work is due to three facts taken into combination: (1) that caries is universally prevalent, (2) that it is essentially preventable, and (3) that it is the cause of an enormous amount of illness.

A GREAT OPPORTUNITY.—Is there any other condition that is the underlying cause of so much illness or inefficiency, and is there any other condition of equal importance that is so preventable? My answer to both these questions would be in the negative. Modern knowledge appears to point to health being destroyed principally by two conditions—the entrance of infection into the body and the disorder or depression of functions that allows these infections to flourish. The mouth is one of the commonest portals of entrance of infection, and the bad habits and wrong feeding that cause dental caries, the inability to masticate food produced by it, and the swallowing of quantities of septic matter must produce derangement of the functions of the whole of the digestive tract. They must also tend to destroy the natural bactericidal action of a healthy stomach, a most important matter. We are here dealing with not a disease which we might alleviate or, to some extent, prevent, but with a powerful cause and condition liable to aggravate every other disease. We have an opportunity such as does not present itself in any other branch of preventive medicine. Unfortunately we are so preoccupied with the treatment of disease and the prevention of specific diseases that this, perhaps the most fundamental cause, is relegated to a secondary position. I would ask you to give the weight of your authority to a national scheme for the prevention of dental caries.

DISCUSSION.

FAILURE OF EXISTING METHODS.—**DR. ROBERTSON**, Medical Officer for Birmingham: The subject Dr. Wheatley has brought before us is one to which I have given considerable attention during a long number of years. We have really done very little up to the present in the way of substantially improving the condition of the teeth of the mass of the people in this country during the last twenty or thirty years. Nobody could hold the position I do without recognising the truth of what Dr. Wheatley has said in regard to the enormous

amount of damage done to the nation by dental caries and the inefficiency of the methods which we have taught. We have, for instance, agreed that our best method was the use of the toothbrush, but we cannot but be impressed with the fact that large numbers of the people, who do use the toothbrush with reasonable care, do not prevent the mischief, and one cannot help thinking, therefore, that some other method must be suggested.

CALL FOR AN INQUIRY.—The damage is so widespread and so universal that the only authority capable of dealing adequately with it is the Ministry of Health, and I look forward to the time when the Ministry will institute an inquiry into the causes and prevention of dental decay and make some pronouncement to the whole dental and medical professions as a result of careful investigation. If, for instance, it is true that substances like milk and sugar and perhaps white flour, are amongst the most dangerous which we can use in the causation of dental caries, every one of us will do something to limit their harmful use, but it is going to take convincing evidence before such a general abandonment of the main articles of diet can be thought of as a general recommendation to the public.

I would urge, therefore, that such a general inquiry into the whole question is a matter of urgency and of much greater importance to the nation than nine-tenths of the investigation work which is being undertaken at the present time. The bulk of the people have never appreciated the amount of damage done by dental caries. We have to see large numbers of young adults suffering from tuberculosis. The state of their teeth is perfectly appalling. The conditions found during recruiting for the Army in the recent war gave us a good idea of the defects in the teeth of young men, and form one of those debilitating influences which predispose to tuberculosis. I consider Dr. Wheatley's paper a valuable statement, and although I have not sufficient information to say that I agree with him in all that he has said, I think it is desirable that his paper should have the widest possible circulation and that your Association should take an opportunity for pressing for an inquiry.

TREATMENT, A PALLIATIVE.—**DR. AUDEN**, School Medical

Officer for Birmingham : The School Dental Service, regarded from a preventive point of view, cannot be said at present to have achieved success. When you think that last year we treated in our school dental clinics in Birmingham 24,000 children of various ages and about 49,000 teeth had to be extracted, you can see that the work has been too late to be of real preventive service. It is purely palliative. We have not begun our true preventive work, and this applies to other branches of our medical service. We are far too much concerned with treatment and have not yet begun to go down to the root of the matter. When we began our school dental service we thought that the best age to begin to examine was 6 to 8, but it was very quickly borne in upon us that we were beginning far too late. Unless you can have a complete dental supervision of the children and keep up the work which is begun, it is all thrown away. It is impossible to get the community to realise that your dentists should confine themselves as far as possible to keeping under supervision the children that they have already treated. I am in absolute agreement with Dr. Wheatley.

THE DIETETIC FACTOR.—With your permission I will read a quotation from my last report :

“Extended research does not appear to have brought us any nearer to a practical solution of the problem of the prevention of dental caries. A disease so universal that it has become accepted almost without question as the lot of every individual, it is yet known as the predisposing cause of more ill-health and disablement than any other single infection. . . . No system of treatment, however efficacious, can be regarded as more than palliative. Constant supervision and recurrent treatment without doubt delay the extension and prevent the deleterious results which follow the infection, but it cannot be too strongly impressed upon all that dental caries and all its attendant disorders will continue to be a drain upon the community until the underlying cause is found and removed. Nor will the universal use of the toothbrush and antiseptic mouth-washes, valuable adjuncts as they are, greatly avail. Treatment, however early begun, does not get at the root of the problem, and is but building upon the sand castles which will be submerged

with each successive wave of child life that comes under observation from year to year. There appears no doubt that one great cause lies in our dietetic habits, and especially in the early methods of feeding of children, which tend to relieve the jaws and teeth from the due performance of their proper function, viz., mastication. Soft pultaceous foods and highly refined flours require but little, if any, mastication, and form accretions of fermentable carbohydrates between and around the teeth. Dental caries is a fermentative process. To change the long-established dietetic custom of a nation appears a forlorn hope, but much can be done by teaching systematically the necessity of the addition of some firm, fibrous and resistant articles of food to the diet of children. Roasted bread, or toast, apples and similar fruit, rub and scour the gums, and leave the teeth clean at the end of a meal. Teaching of this kind could well be given in schools, and by leaflets and lectures."

A LESSON FROM EGYPT.—May I give you the figures that we had worked out concerning the number of children examined in our schools in the six months ending April 21st last? We actually examined 38,350 children; of those 28,000 were found to require treatment. Thus 73.5 per cent. require treatment. Of those we have only found that one-third of the parents have taken the trouble to accept the treatment offered. That points two main lessons: one is, that you must have active propaganda amongst the community as a whole as to the trouble which arises from defective teeth, and you must begin earlier on a preventive basis. If only 30 per cent. of the children known to require dental treatment are treated, you will see how very large is the proportion of persons who will go on in later life physically inefficient. One great difficulty is that such large numbers of our teachers have themselves taken no care of their own teeth. In the examination of pupil-teacher candidates, again and again one finds that a young girl of 14 to 16 is brought up with a mouth in such a shocking condition that there is little to be done. The fact that there must be something in our dietetic habits was borne in upon me very strongly when I was in Egypt, where I examined large numbers of Fellahin labourers every week, for I was struck with the extraordinary beauty of their

teeth. I feel sure, since they live on hard fibrous material, *i.e.*, on a dietary largely vegetable and oily in character, on their corn which they grind in their own homes, that there lies the secret of their dental after-health.

A PREVENTIVE BASIS ESSENTIAL.—One other trouble is this question of following up. I think all education authorities are liable to be under the tyranny of figures; they want a large return for the money expended, and the sole criterion upon which they can judge is in the number of children examined. If we would confine ourselves to treating those children whose parents will undertake to carry out fully our instructions and to submit them to periodic reinspection, then we should manage to do far more than by our present method. In our Birmingham returns we find that 38 per cent. of the children are casual cases of children who have waited until they have toothache and then come up for treatment. This 38 per cent. is really nothing more nor less than simply the provision of cheap dentistry, which does not seem to be the proper function of a school dental service. This should be based solely on preventive lines as a branch of preventive medicine. We should simply say we shall not touch any children whose parents will not undertake to submit them to dental inspection and treatment year by year throughout their school life. I do feel very strongly that our work must be based on purely preventive measures, and therefore I realise the truth of what Dr. Wheatley has said, that there is a danger lest we shall continue to fritter away large sums of money on palliative measures, which could be devoted to other purposes.

MR. A. H. PARROTT: Dr. Wheatley has given us a magnificent exposition. The figures are exceedingly striking and helpful. It has seemed to me throughout the war that my patients generally have been in better health and better physical form, and with less caries during the period of restricted diet, and I have attributed this as being to some extent relative to the diminished consumption of sugar as found in confectionery and sweetmeats.

MR. R. CLAYTON COOPER: Dr. Wheatley lays particular stress on the fact that he considers dental caries to be caused by a question of wrong diet, but one cannot help feeling that

there must be something else beyond this. One naturally looks to one's own children in a critical way. I myself have two girls, and the elder child when she was 3 years old showed distinct signs of caries. Both these children have been brought up in the same way, but the younger child has had practically no signs of caries, although now $8\frac{1}{2}$ years of age. If caries is caused exclusively by diet, why should one have caries and the other not? I have taken particular notice of the time of taking liquid for the last few years and have endeavoured to take fluid apart from a meal, but I should like to know what Dr. Wheatley considers to be the best time to take any fluid which is necessary. My own finding is that the best time to take it is about two hours before a meal, not immediately after, and I should like to know if Dr. Wheatley can confirm this point.

MR. G. F. CALE-MATTHEWS: We owe a debt of gratitude to Dr. Wheatley for bringing this subject before us in such a manner. It is quite uncontroversial in the great object it seeks to obtain, viz., the health of the nation. I would like to make one suggestion, that more attention should be given to the perfecting of the denture through the practice of orthodontics. In an assembly such as this it is possible that no one present is possessed of a natural denture with perfect occlusion. Perfect occlusion invariably means freedom from caries, and the fears evinced by many that caries is often started through the wearing of corrective apparatus should be shown to be due to faulty treatment or want of care. The figures quoted by Dr. Wheatley are startling, and one hopes that subsequent examinations may prove their correctness. The school dentist should have every opportunity of practising the perfection of dentistry, and the tabulation of figures, which in many cases involves much time, should be given into lay hands. The responsibility resting on the school dentists is a heavy one and the future dental health of the nation rests largely in their hands.

MR. F. W. RICHARDS: To have three medical men discussing this important subject is a hopeful sign. I feel in complete sympathy with the optimistic view taken by Dr. Wheatley in his most interesting paper. He tells us that the medical profession are now investigating the causes of dental caries; they appear, however, to be approaching the subject from a

different point of view from that usually taken by dentists. This may unfortunately tend to cause some confusion of thought on the subject. Questions one feels inclined to ask are :—

In considering the action of food in causing caries, in spite of the shortage of sugar during the war, many children have still had far too many sweetmeats, has dental caries obtained with them or not ? Is it not the fact that persons who never take milk suffer from dental caries ? What are the other causes of this disease besides the condition of the saliva ? Why are some districts more notorious for dental caries than others ? How are these important factors to be brought to the knowledge of parents ?

MR. ARTHUR BRITTEN : It is a joy to see that the propaganda that is already begun in Dr. Wheatley's county is being pursued with enthusiasm and is bearing fruit. Dr. Sim Wallace gave the experience of his own family. He had two boys of 13 and 11, the mother and father had been extremely prone to caries, but these boys had been brought up on Dr. Wallace's dietetic system, and their dentures were perfect and faultless and they had never had any dental treatment except that included in the system. There are controversial matters, of course, especially as regards the causation of decay, but in the main we can agree that one of the greatest factors is the acid decomposition of carbohydrates. I am astonished to find in my practice as school dentist that amongst the boys under my treatment from 9 to 14 there is an extremely large percentage of dentures that are quite caries free ; approximately between 20 and 30 per cent. were perfectly free from caries on admission. If we accept the fact that the largest element of causation of decay of the teeth is due to the decomposition of foodstuffs, then we are up against the proposition of Mr. Cale-Matthews that a great deal depends upon the efficiency of the instrument you have got. The food ought to be masticated properly, but the question is how to get this efficiency. The fact is, owing to the faulty methods of feeding, the denture does not get a chance of becoming an efficient machine. Children who have developed the habit of "boltophagy" cannot get back into the habit of thoroughly masticating their food ; hence the importance of beginning with a correct dietary and especially beginning

early with this habit of mastication in children. If Birmingham authorities could distribute regularly and systematically one million copies of this leaflet, we should be doing our bit. I am out for as much propaganda as we can get. As to our personal influence, I am always at it, but we have to overcome the inertia of conservatism and few parents will adopt the full scheme whole-heartedly.

MR. H. E. ROSE : I am in a favourable position for observing the effect the feeding of children has upon their teeth, having the dental charge of 300 children in a convent school. These children come from all types of the lower classes and are under my care for ten or twelve years, until they leave at about the age of 16 years. When they arrive their teeth and mouths are generally bad, but before the end of twelve months all gum trouble has cleared up, decay arrested and the cavities have become hard and polished. The diet has not been changed much during the war, but I did notice a marked improvement in their teeth about the time Dr. Wheatley refers to. If there were any extractions to be made, the bone seemed so hard that it was like extracting the teeth from a strong man.

MR. A. W. WELLINGS : We can do a great deal ourselves in guiding the medical profession in dental matters. I was pleased to hear the stress put upon the consumption of sugar, especially beet sugar. The incidence of caries does vary with the consumption of sugar and the effects that manifested themselves during the war, as Dr. Wheatley pointed out, are no doubt due to its diminished consumption. We can all agree that the matter is still a great problem, and can only be explained by research. There is scarcely a dental school in the country in which research is being carried on, and I should like Dr. Wheatley to bring that fact before the authorities.

DR. WHEATLEY, in reply : I want to thank all the speakers for the kind way in which they have received my paper. Mr. Cale-Matthews lays great stress on the acidity of the saliva, and appears to contend that acid saliva acts directly upon the teeth. It is, however, exactly those points to which the saliva does not gain free access that decay, and not the free surfaces of the teeth that are bathed in saliva. The effect of acid saliva as a factor in caries-production by failure to neutralise the lactic acid formed from food is a matter

probably requiring further investigation. What, however, does seem clearly proved, is that the enamel is destroyed by the lactic acid formed from food and in no other way.

One of the speakers mentions that a large number of the parents refused treatment for their children. In my county we take a great deal of trouble to explain the benefits to parents and to persuade them. The school teacher uses his influence and the objecting parents are in many cases visited by the school nurse, with the result that a large proportion of the parents consent.

As regards education by leaflets, in order to make one's teaching effective one has to make it very definite. It is a great aid if one can crystallise one's teaching in a few definite rules.

In Mr. Clayton Cooper's experience of his two children, there is nothing which tends to disprove the statement that caries is caused entirely by the character of food and the way it is eaten. Two children of the same parents may have differently shaped jaws and teeth, just as they may differ in any other respect, even though brought up in exactly the same manner. As our method of feeding, however well directed, will not altogether prevent dental caries, is it not quite in accordance with expectation that the caries will not be evenly distributed among such children, but that some will be free from caries and others will suffer to a greater or less extent, the determining factors being the shape and arrangement, and perhaps the hardness, of the teeth, or some unnoticed peculiarity in eating ? After the teeth are developed, food and the way it is eaten are the sole determining factors. As regards the best time for drinking, the important matter as affecting the teeth is not to drink at meal times. There are good reasons for thinking that the bulk of liquid should be taken on an empty stomach and at least half an hour before a meal. I always advise that school children should be told to drink at the interval for play. I agree with Mr. Cale-Matthews that a great deal of harm is done by saying that clean teeth do not decay, because teeth that are clean in the ordinary sense do decay. Mr. Rose's experience is extremely interesting. He has an opportunity of carrying out investigations of the utmost value. Few people have such control of large numbers of children that they are able efficiently

to inculcate habits of mastication. We must remember that these children are from the poorest of the population, and the poorest people have far better teeth than the well-to-do working classes, who have the worst teeth in the country.

Mr. Richards spoke of the condition of the teeth in different parts of the country. In Wales, I believe, the teeth are bad; it may be due to some extent to heredity, but I should doubt that very much. I am not at all surprised that in the Eastern States of America the teeth were worse than in the Western States. It is what one would expect. I do hope more investigations will be forthcoming to clear up the doubtful points.

AIDS TO DENTAL FITNESS.¹

[Only a handful of school dentists were able to attend the Manchester Conference even when, like so old a friend of the Society as Mr. George Thomson, they had enrolled themselves as members by way of indicating their sympathy. The official report of the discussion on the paper read to the School Dentists' Society, on December 12th, 1919, and repeated at the last session of the Conference under the title "Educational Methods Among Children and Adults," is therefore also included. In this way the special knowledge and point of view of this branch of the dental profession will be made more generally available.—Ed.]

THE NEED FOR PROPAGANDA.—MR. GEORGE THOMSON said he wished to express his high appreciation of the paper. The subject was one not only of the greatest importance to the Society but to the whole nation. The prevention of dental disease meant also the prevention of many other diseases, and the School Dentists' Society should do its utmost by propaganda to this effect.

"Better put a strong fence round the edge of the cliff,
Than an ambulance down in the valley."

VITAMINES.—MR. VALENTINE KAY asked if the lack of vitamins was not greatly responsible for dental decay, and whether, according to Dr. and Mrs. Mellanby, the essential

¹ Reprinted, by permission, from the *British Journal of Dental Science*, March, 1920.

food factor was fat soluble A? Could Mr. Hecht give any information concerning these vitamins? The tooth, like the hair, is an epithelial structure, and, like hair, may vary by hereditary tendencies in consistence. Hair may be fine, coarse, long, or short, thick or thin—so, too, we get colour, density and shape all varying. If the mother's health is impaired, then the child's health will suffer from birth. Ill-health in the child influences its dentition and the liability to dental decay.

EFFECTS OF WAR-TIME DIET.—MR. HUGH LOVE said the paper was one of the most interesting that had been read before the Society. The full effects on the children's teeth due to war-time food would not be observable for a year or two; the amount of tartar was also distinctly greater during the last three years than previously, though at the same time less decay was met with in the molars and bicuspid, due to rougher food requiring more use of these teeth and less of the incisors, accounting for the presence of the tartar. Oatmeal porridge was of much greater value as a food when taken with milk instead of golden syrup or sugar, as was often the case.

FACTORS IN IMPROVEMENT.—MR. EVELYN SPRAWSON thanked Mr. Hecht for the facts that he had brought forward, and said that dentists fully recognised the importance of the character and value of foods in preventing dental caries—indeed, they formed a subject taught in all dental schools. With reference to tea causing dental caries, he did not think this was so, but that tea drunk as a decoction instead of an infusion undoubtedly caused indigestion, and indigestion being so frequently associated with bad teeth had therefore given tea rather a bad name. Many, and particularly the poor people, drank tea as a very strong decoction—really a solution of tannin—which was anathema to most people. Concerning vitamins, he had not seen it stated as a fact that absence of these actually caused hypoplasia of teeth and hence predisposition to caries. Their absence was known to cause rickets, itself often associated with hypoplasia, but otherwise it was a matter of inference rather than of proof. He had noticed recently in inspecting a large number of children that, taking those aged from ten to fourteen

years, 48 per cent. showed no trace of dental caries in their permanent dentitions, and their mouths were very clean, whereas in pre-war days children of the same age at the same school showed only 31 per cent. free from caries of permanent teeth—a difference of 17 per cent. He thought three possible factors had been at work to bring about this marked difference : (1) Early dental treatment of deciduous teeth, (2) greater use of the toothbrush and oral cleanliness, (3) war food and rationing, with its many carbohydrate restrictions. He was inclined to attach most importance to the third item, but was still engaged upon the subject, and would be glad to hear of other dentists' findings and opinions. Concerning porridge, it was always a source of satisfaction to think that it had been first condemned (dentally) by a Scotsman—Dr. Sim Wallace. If a mere Southron had dared to suggest it, people from the north of the Tweed would never have believed it, and would have wondered at his temerity. Mr. Hecht had referred to the way porridge was made in Scotland ; though it was common knowledge to the Scotsman that no Englishman knew how to make it, he had never yet met two Scotsmen who really agreed as to how it should be made.

ENCOURAGING COMPARISONS.—MR. WILLIAM FISK said : For some years I have been attending a large residential Poor Law school, population average 500 to 530, and there we certainly do not see the bad dentitions that an examination of the model on the table might indicate. The percentage of sound dentitions is very high indeed. I attend another residential benevolent school where the children are perhaps better placed socially. Their dental condition is not equal to that of the Poor Law children, but is still very good. I am trying to find out the cause of the difference, and whether the problem is a dietetic one. These children are quite different, from the dental point of view, from those outside—especially the Poor Law school. One explanation is that the laws of hygiene are carried out. Every adverse health condition is dealt with and the children are under supervision from an early age, and I can assure you that the results are quite good : many of the children, one would think, are immune from caries.

FIGURES FROM A PUBLIC SCHOOL.—Mr. SIDNEY SPOKES thought the Society would appreciate the excellent work which the Food Education Society was evidently doing, and Mr. Hecht's paper might be regarded as a good piece of propaganda work amongst the members of the School Dentists' Society. He (the speaker), for one, had not been previously aware of the extent to which the Food Education Society had been dealing with this very important subject. Amongst food materials, cheese had been mentioned in the paper. It was well known that some persons were quite unable to take it, but those who could should certainly do so. He thought it contained one of the vitamins which had been alluded to. Mr. V. Kay had asked for further information about vitamins, and he was not alone in that desire, for at present practically nothing was known as to their composition. With regard to Mr. Sprawson's remarks about improvement in school dentitions, he (the speaker) knew of a public school where some twelve years ago only 9 per cent. on examination were found not to require dental treatment. The boys were inspected each term, and recommendations made as to what should be done before the next term. The percentage steadily improved, and reached 30 per cent. before the war. In 1918 it was 43 per cent., so that apparently rationing and war food had not, at least, affected the teeth adversely. Probably, however, the improvement was not altogether due to feeding, but to the fact that the mouths were in a more healthy and functional condition. Incipient decay was discovered and treated in an early stage, and only 3 per cent. were now to be found described as "bad," *i.e.*, with more than four teeth affected, and in many of these the decay was in the initial stage.

DIET : THE WEIGHT FETISH.—Mr. C. DOSWELL WALLIS said : One point that might be brought out is the close interrelation between food and teeth. Suitable food makes for sound teeth, and sound teeth in sufficient numbers make for the proper mastication of food, and are an important feature in the extraction of all the nutriment possible. Great damage is done to teeth of children by improper feeding. This is, in a measure, due to the instructions given to parents by the average doctor, who, perhaps very naturally, advises what

is practically an *invalid diet* for young children, instead of hard, coarse food such as a child likes and can easily masticate. The effect of this method of feeding is well brought out in the reports of investigations by school doctors, as published in the Chief Medical Officer's report to the Board of Education for 1914, in which, judging of a child's development from height and *weight*, it was shown that on the whole the best developed and heaviest children had the worst teeth. This is, of course, an obvious fallacy, as the two things are the result of a common cause, namely, excessive starchy food, which makes a child large and heavy, though flabby, and at the same time is conducive to dental caries, whereas poorer children, who have scanty food, and that of a tough and vegetable nature preponderating, are lighter in weight, but stronger and more wiry. Shortage of staff in West Sussex has made it impossible to attend to all the children during a twelvemonth, and following-up has been after an interval of from two and a half to three years. The children's teeth and mouths that have been formally put into good condition were found to be keeping well on reinspection. *None* had more than *four* carious teeth, and *seventy-five* per cent. had dentitions free from decay. Possibly this splendid result may be in part due to eating war bread, and to the general shortage of foodstuffs and rationing. The only hope of combating successfully the enormous amount of dental disease amongst children is by *prevention*, as any attempt at *cure*, after the bad condition has become established, is a hopelessly vast proposition. One of the most important factors in prevention is attention to *correct diet*.

BREAD AS OUR STAPLE FOOD.—The PRESIDENT,¹ in closing an interesting discussion, thanked Mr. Hecht for his thoughtful paper. The food problem was one of complexity, full of curious anomalies; but in trying to avoid extreme views it was essential that fundamental truths should not be forgotten. Granted that conditions were normal, the teeth of animals were cleansed by the food they masticated. Bread—our staple food—is gradually being deprived of every particle of fibrous material, viz., that material which, from a physical point of view, is essential to cleanse the teeth while exercising

¹ Mr. Denison Pedley.

the jaws. From the nutritional point of view, something is missing when the fibrous portion of the flour is abstracted. Hence the discoveries and discussions with regard to vitamins, of which at present we know so little. Our experts tell us that the nutritional value of war bread was greater than that of white bread. It is true that it seemed to upset many adults, and that is why we have gone back to white flour again ; but why could it not be used for the children ? They need the extra nutritional value, and it very effectually cleansed their teeth.

MR. HECHT, replying to Mr. Russell Forbes, who asked why he was so down on tea,¹ explained that all the references were parts of quotations, and that he had not expressed a personal opinion ; to Mr. Valentine Kay, who sought information regarding the work of Dr. and Mrs. Mellanby and the fat soluble A vitamin—this was contained in butter, cheese (from whole milk), cream, eggs (yolk), and certain other fats, as well as in green leaves ; to Mr. Sidney Spokes, who raised the question of the indigestibility of cheese, Mr. Hecht suggested that it, like nuts, had unjustly acquired this reputation, owing to it being usually eaten after much nitrogenous food, for which they were both substitutes. Cheese required thorough mastication, and was more readily assimilated when grated or passed through a mill. To the President.—Referring to the physical condition of school children, he endorsed Dr. Taylor's suggestion at the Guildhall, that "the weight fetish" should be got rid of. He shared the President's disposition to attribute the improvement of children's health during the war in large measure to war bread. He thanked members warmly for their reception and patient hearing.

¹ See *Facts for Patriots*, 1st series, 4d.

PART III

FOOD EDUCATION SOCIETY

OBJECTS AND METHODS

FOOD AND EFFICIENCY.¹

"No, we are *not* a vegetarian society," Mr. Charles Hecht, of the National Food Reform Association, St. Stephen's House, Westminster, told an inquirer the other day. "Our object is to *widen*, not to narrow, the choice of foodstuffs of the community. We adhere to no special dietetic creed, just as we have no personal axe to grind. Our aim throughout has been entirely philanthropic."

"How did we come into existence? Indirectly, through the Report of the Inter-Departmental Committee on Physical Deterioration, which, some ten years ago, you will remember, aroused grave concern as to the future of the race. A national awakening to the urgency of diet and health reform generally followed.

"That the use of improper or insufficient food is one of the chief causes of physical degeneration, and, next to bad housing, the most potent source of drunkenness, was emphasised by the above Committee, and has been recognised by our Association from the first. We are supported by all the highest medical authorities: Sir Lauder Brunton, Dr. Robert Hutchison, Professor Sims Woodhead, to mention only one or two, and well-known social reformers, such as Mr. Seebohm Rowntree and Mrs. Sidney Webb. We seek, by every possible means, lectures, meetings, cookery demonstrations, classes, and the publication of cheap and useful recipes, to teach the nutritive value of foods and their best methods of preparation. Two of our booklets, *Hints towards Diet Reform*, and *Economical Dishes for Workers*, are in such request amongst heads of households, social workers, and wage-earners, especially since the outbreak of war, that three editions of each, making some 50,000 in all, have already been called for.

¹ Reprinted, by permission, from *The Common Cause*, September 3rd, 1915.

"The energies of the Association early became focused on the reform of diet in schools, colleges, hospitals, and institutions generally. In 1910 a large and influential conference of hospital matrons was held at Caxton Hall, Westminster, to discuss the feeding of nurses, and many reforms in this direction have since been effected. Monotony is gradually being conquered by increased forethought, and the introduction of alternative dishes. The quality and service of the food provided is receiving more attention, and the hurry and rush which formerly characterised nurses' meals are no longer permitted. These reforms have been facilitated by the issue of the Report of the proceedings.

"Encouraged by this success, we next called public attention to the diet of the school in relation to the growing child. A big educational conference, in 1912, on Diet and Hygiene in Public Secondary and Private Schools, Preparatory and Advanced, Boarding and Day, was the result. It was held at the Guildhall, London, the Lord Mayor presiding, and over 250 schools were represented. Interesting features were the exhibition of diet sheets from some of the leading public schools, such as Haileybury and Christ's Hospital, and 'Tuck Shop' and 'Grub Box' regulations.

"We found that the chief defects alleged against school diet were monotony, stodginess, bad cooking and service, lack of vegetables and fruit (hence the introduction of the tuck-shop and grub-box, with their accompanying digestive evils, too often sowing the seeds of adult ill-health), insufficient time for meals, and bad kitchen arrangements. The absence of any recognised *standard* of school dietary was felt to be at the bottom of most of these shortcomings, coupled with incompetent housekeeping. The latter defect we have taken steps to remedy, at the same time opening up to women a new, attractive, and remunerative career."

"What has been the effect of the conference upon the schools?" Mr. Hecht handed across a bulky volume, *Our Children's Health at Home and at School*, edited by himself. "This is not a book that lies idle upon the shelf," he said. "Every up-to-date headmaster and headmistress in the country keeps a copy at hand for reference, whilst a number have become members of the Association. Parents study it before selecting schools, and consult the representative school

committee. So do heads of schools and houses wishful to effect reforms and economies."

"Is not the feeding of the children of the wage-earners just as important as those of the middle and upper classes?"

"Every bit. Indeed, we held a small conference on this subject in the year of our birth—1908. But I am coming to that. It was recognised that the primary schools must be dealt with separately. So we called a second conference the next year, 1913, again at the Guildhall, which was attended by leading school medical officers and teachers of cookery and hygiene, representative of educational authorities, the National Union of Teachers, philanthropic institutions, and social workers. This conference ranged over an enormous area, and touched upon many subjects, including the life and diet of primary scholars and their parents, the teaching of cookery, open-air schools, Poor Law institutions, diet of town and country, experiments in feeding and cookery teaching at home and abroad. This second book," and Mr. Hecht indicated a volume even larger than its predecessor, entitled *Rearing an Imperial Race*, "is the outcome of these efforts. This also is having a wide sale and influence, not only here but in America. It is interesting to note that her Majesty the Queen, on hearing of the conference, intimated her desire to receive this book. She has also accepted many other of our publications, and has expressed great interest in the work done by Miss Petty, with the approval of the Central Committee on Women's Employment and the Queen's Work for Women Fund."

"What are we doing during the war? Well, naturally, with the constant rise in food prices, our primary object is to help housewives to secure economy with undiminished, nay, far greater, efficiency. Our lecturers and demonstrators, led by 'The Pudding Lady,' as Miss Petty is called, show how cheap and nourishing meals may be provided at 1½d. per head. We are also issuing an entirely new series of food booklets, *Facts for Patriots*, and these, like the little books of recipes, are selling in their thousands.

"We shall work still harder after the war is over. The pinch will be felt by all classes for some considerable time, and we shall have to increase, not diminish, our efforts in the future. So shall we justify our existence, and, incidentally,

MEMBERSHIP

411

fulfil the unconscious prophecy uttered by Sir Lauder Brunton, when the Association was first started : ' I certainly think,' he wrote, ' it is a movement in the right direction, and if harder times come upon this country, then food reform will tend to increase the power of the country to bear them.' "

D. M. FORD.

MEMBERSHIP.

The Society is working for food, cookery and health reform in co-operation with the heads of the medical, dental, and educational professions and social reformers generally. It has neither dogmatic policy nor dietetic test, and is entirely dependent on voluntary contributions.

All in general sympathy with its aims are cordially invited to help by enrolling themselves as members.

A subscription of £1 and upwards entitles the giver to receive a monthly copy of *National Health*, its organ, in the publication of which it joins with the National League for Health, Maternity, and Child Welfare, and other societies. The annual subscription to *National Health* is 8s. 6d., post free. Each number contains an article on some aspect of diet or hygiene, with notes on the work of the Society. A specimen copy will be sent on receipt of 10d.

Additional particulars of the work, including arrangements for cookery demonstration lectures, drawing-room and other meetings, membership and banker's order forms, may be obtained from the Hon. Secretary, Danes Inn House, 265, Strand, W.C.2.

PUBLICATIONS

CHILD WELFARE AND THE EDUCATION ACT.

" Attention has been increasingly directed to the close connection between educational and physical efficiency."—The President of the Board of Education, The Rt. Hon. H. A. L. Fisher, August 10th, 1917.

" It must not be forgotten that the education of the young child is primarily physical, and not primarily intellectual."—The Rt. Hon. Lord Gainford, Ex-President of the Board of Education, July 22nd, 1913.

"We must have healthy homes, before we have healthy schools."—Dr. Clement Dukes, Hon. Consulting Physician to Rugby School.

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EDITED BY CHARLES E. HECHT, M.A., M.C.A.

Hon. Secretary Guildhall School Conferences and Manchester Conference on the Prevention of Diseases of the Teeth, Editor of *Rearing an Imperial Race*, Author of *The Feeding of Children*, etc., and Joint Author of *Dietaries for Schools*.

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The Conference was attended by some 250 heads of schools or their representatives, school medical officers, members of the Parents' National Educational Union, Child Study Society, and educationists generally. Members were welcomed by the Lord Mayor, himself, appropriately enough, a veteran member of the medical profession. His speech, as *The Times* observed, provided a statement of general principles, "so lucid, concise, and comprehensive, that it will not easily be superseded."

The morning session, which had as its chairmen successively Mr. E. B. Malim, the new Headmaster of Haileybury, and Miss M. A. Douglas, President of the Association of Head Mistresses, was devoted to the consideration of "Diet as a Factor in Physical, Intellectual and Moral Efficiency, Existing Methods, and the Main Lines of Reform." The paper on the first subject was contributed by the eminent authority on diet in schools, Dr. Clement Dukes, Honorary Consulting Physician to Rugby School, to the value of whose teaching more than one tribute was paid during the course of the proceedings. On the two latter subjects papers were contributed by Miss M. E. Robertson, Head Mistress of Christ's Hospital, Dr. A. A. Mumford, Medical Officer of the Manchester Grammar School, who dealt with the problem from the day-school point of view, and pleaded for closer co-operation between the home and the school; Mr. W. H. Prosser (Snettisham Grange, Norfolk), who described his successful experiments in diet reform at a preparatory school, and Dr. Sim Wallace, who treated the subject from the dental standpoint. The discussion was opened by Dr. Robert Hutchison, and was carried on with unflagging interest until the hour fixed for the adjournment.

The first portion of the afternoon session, over which Dr. Shelly, President of the Medical Officers of Schools Association, and Chairman of the Special Committee, presided, was given over to the consideration of "Instruction in the Elements of Physiology and Personal Hygiene," upon

which papers were contributed by Dr. Alice M. Burn, formerly Medical Officer at Wycombe Abbey School, and Dr. Cecil Reddie, of Abbotsholme, the discussion being opened by Dr. Odery Symes, late of Clifton College.

The second portion of the session, when Miss E. M. Guinness, Vice-Principal of Cheltenham Ladies' College, filled the chair, was occupied by the discussion of Mrs. Stanley Hazell's paper on "Problems of Institutional Feeding," and that of Miss Marie Michaelis, of King's College, on "Training for Institutional Work," the openers being respectively Mrs. K. C. House, wife of a House Master of Malvern College, and Miss Mabel Atkinson. In addition to the papers, discussion, dietaries and other particulars contributed to the display, many important comments, articles and letters will be incorporated in the Official Report.

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INDEX

A

	PAGE
Abderhalden	34
Accessory Food Factors (<i>see</i> Vitamines)	
Acidosis	114, 115-117
how preventable	115
Adami, Dr. J. G.	7-8, 53-56, 162-172, 193, 296, 310, 348, 360, 375
Addison, Dr. Christopher	382
Adenoids	28, 29, 31, 58, 60, 108-110, 224-225, 255
(<i>see also</i> Dental Disease)	
origin of	28-29, 224
African tribes, diet of	67-69, 71, 77-79
A Health Visitor	305, 307
Aids to Fitness	1, 122, 126, 128-131, 133, 140, 149-150, 312, 322
Allaey, Dr. H.	66
Alcohol	55, 111, 314, 318
Anderson, W. C.	21
Appendicitis	22, 23
(<i>see also</i> Dental Disease)	
Apple	51, 107, 118, 129, 248, 270, 309, 396
(<i>see also</i> Oral hygiene, value of fruit)	
Arabia, an object lesson from	50
Aristotle	66
Ashton, Percy	222-223, 227, 288-291, 293
Auden, Dr. G. A.	383, 394-397

B

Badcock, J. H.	210-216, 219, 349, 360, 369, 378
Baker, L. W.	214
Baldwin, Sir Harry	321
Ballantyne, Dr. J. W.	112
Baly, C. Peyton	315
Bananas	290
Bardswell, Dr. Noel D.	23
Barley	98, 101
Barotze, diet of the	67
Bates, William	256-259, 268
Beckett-Overy, Dr. H.	59, 60, 171
Behrens, Alderman Sir Charles	337, 338
Bennett, Norman G.	214, 219-220
Benson, Ellis	14
Beri Beri	100
Bibby, Edward	139
Biscuits	45, 49, 118, 130, 189, 191, 192, 272, 301, 317
(<i>see also</i> Milk)	
"Bite and Sup," habit of	141, 333
Black, Dr. G. V.	84, 200, 220, 226, 252, 269

PAGE

Board of Education	159, 322
Boleyn, Dr. J. G. W.	21, 126
Booth, Mrs. Bramwell	62
Boys, Professor	2
Bradford, Dr. E. H.	61
Branthwaite, Sir R. Welsh	111
Bread	2, 12, 32, 44, 58, 80-97, 102, 133, 191-192, 197-198, 216-217, 222, 256, 263-264, 270-271, 316-319, 349, 406-407
and butter	88, 90, 93, 132
and honey	189, 331
and jam	90, 189, 192, 317-318, 331
and marmalade	86-87, 90, 188-189, 192, 331
and milk (<i>see</i> Milk)	
barley	253, 268
crusts	7, 51, 57, 83-84, 88-89, 128, 162, 191-192, 198, 254, 267, 270, 329, 331, 351, 361, 406
dried (<i>see</i> "Scrunch")	
excess of starch in	188
germ of	95-96, 256, 271, 321
impoverishment of	32, 198, 316-317
need for legislation	12, 97, 254, 256, 382, 389-390
sale of new	57, 118, 198, 267, 391
rye	97-98, 224, 257
Vienna	96
war	197, 267, 351, 406-407
waste of	254
white, where a luxury	97
Bread and Food Reform League	256
Breast feeding (<i>see also</i> Dental Disease)	
4, 126, 207, 216, 229, 235, 236, 273, 276	
an incidental advantage	213
British Dental Association	51
Britten, Arthur	399
Brown, Edward E.	416
Brown, Sir Charles	24
Bruce, Miss Gwendolen	375-379
Brunton, Sir Lauder	62-63, 179
Butler, Samuel	3
Butter	191, 205, 210, 216

C

Cake	86, 97, 129, 132, 321, 328
(<i>see also</i> Dental Caries and Dental Disease)	
career of a piece of	248
Cambridge, as a pioneer	274-277

	PAGE		PAGE
Cameron, Sir Charles	257	Cicero	177
Campbell, Dr., F.C.S.	142	Clifford, the Rev. Dr. John	150
Campbell, Dr. Harry	4, 6, 8, 13, 22, 31, 56, 59, 61, 64, 65, 90, 105, 118, 132, 162, 171, 172, 173-182, 217, 221, 222, 224, 242, 252-253, 258, 260, 263, 268-271, 296, 307, 314, 316, 320, 330, 348, 363-365, 369, 372, 374, 375	Cockerell, Dr. Marion	221-222, 372-375
Campion, G. G.	153, 244-245, 251, 258, 260	Cocoa	192
Canadian Dental Service	163, 164	Cohnheim, Professor	330
Cancer (<i>see</i> Dental Disease)		Colyer, Sir Frank	19, 72
Candy, H.	80	Colyer, Dr. Stanley	66-79
Cantlie, Sir James	19, 106, 125	Comforter	213
Carbohydrates	160, 183-184, 193, 222, 223, 286, 385, 399	(<i>see also</i> Dental Disease and Thumb-sucking)	
(<i>see also</i> Cookery, Dental Caries and Dental Disease)		Cookery	1-2, 7, 305
effects of excess on the teeth	7, 160	British compared with French	1, 2, 43
Carter, The Hon.	16	cooking stove, an enemy to health	107-108
Cassava	67, 71, 76, 79	dental caries and	69
Caxton Hall Conference	320-322	effect on vitamins	106-107
Chamberlain, the Rt. Hon. Austen	382-383	fireless	106-107
Cheeks	213, 248	ignorance of	102, 241, 305, 318
Cheese	405, 407	influence on carbohydrate food	73-74, 79
Childhood, the commonest		merits of slow	106-107
dietetic indiscretion of	60	of fruit	32, 130, 133
Children's diet	7, 28-36, 43, 99, 107, 115, 117-118, 188-192, 216, 222, 273, 285, 301, 304, 306, 318, 329, 331, 406	of vegetables	2, 32, 35, 93, 106, 242
(<i>see also</i> Infants' Diet)		sugar, its use in	2, 63, 130, 133
fruit and	34, 129-130, 133, 191-192, 370	teaching of	1, 42, 241, 242, 305
meat and	34, 130, 131	Cooper, R. Clayton	383, 397, 401
vegetables and	2, 34, 131	Cows, diet of	273
Children, dietaries for	221, 222, 306, 322	Cox, Dr. Alfred	3, 154
Children's employment, a condi- tion of	297	Crawford, William, and Son	309
Children, French and English contrasted	43	Crichton-Browne, Sir James	93
Children, Informal Addresses to		Crowley, Dr. R. H.	13, 159, 415
135-142, 325-326, 332-333			
Children, Jew and Gentile	44, 161, 207		
Children's Welfare Exhibition	320		
Child Welfare Centres	242, 276, 308		
Chittenden, Professor Russell H.	144, 145		
Chocolate	82, 130, 133, 185, 191-192, 222, 266, 267, 268, 272		
(<i>see also</i> Dental Caries and Dental Disease)			
boys who refused	272		
composition of	266		
effect of, on teeth	185, 266		
"Chuck Tuck League"	327		

D

Dates	50
Dennis, J. Hollis	294-296
Dental arches	246, 248, 278-279
clinics	227, 243
finance of	292, 293, 295, 296
of a firm	294, 297
course of studies	120
education, contrasted with	
medical	166
gymnastics (<i>see</i> Mastication)	
profession	8, 10, 11, 13, 25, 31, 48, 164, 153, 168-170, 309
scholarships and loans	121
silk	253, 259, 309
status of	293
surgery, openings for women	119-121
treatment and increased output	297
universities and	170
Dental caries (<i>see also</i> Dental Disease)	20, 35, 68, 160, 183-198, 260-273, 290, 299, 305
a deficiency disease?	261

INDEX

427

	PAGE		PAGE
Dental caries among Shropshire school children	56, 193, 386	Dental Disease, effect on health	10, 18, 20, 21, 22, 23, 161, 172, 228, 229-230, 279, 280, 393
among Staffordshire school children	260	effect of infectious diseases	277, 290
bread in relation to	88	effect of a milk regime	104
causes of	29, 53, 58, 64, 66, 184, 218, 223, 261, 270, 361, 376, 384, 385, 399, 406	effect of war diet	193, 198, 225, 254, 260, 400, 403, 404, 405
effect of illness	227	employers of labour and	37, 39-41, 298, 309
effect of unilateral mastication on (<i>see</i> Mastication)		extent of	6, 174-176, 316
fats, preventive value of	223	gastric troubles and	22, 24, 37, 54
how it starts	73, 81, 184-186, 193, 299-300	hopeful outlook	10, 12, 26, 27, 221, 241, 389, 392
in Australia	290	ignorance and apathy about	230, 239, 294
in children	19, 23, 28-29, 31, 47, 67, 317	ill-health in women and	20, 39, 50, 155, 156
influence of tea on	99, 403, 407	ill-health as a factor	386
in pregnancy	110, 206, 238-239, 388	in candidates for employment	4-16, 387, 396
is it contagious?	224	in children	5, 19, 23, 26, 27, 39, 44, 296
local or constitutional	261	in children in institutions	403, 404
malnutrition and	23, 42, 99	in children under school age	25, 26, 51, 52
need for a national scheme of prevention	57, 393	indigestion and (<i>see also</i> Indigestion)	20, 99
predisposing conditions	31-32, 183, 193	infectious, connection with	277, 290
relation to pyorrhœa	79	in nursing women	221, 228, 229-242, 270, 289, 291
rickets, connection with	7, 92, 110, 114-117, 206, 218-219, 225, 227, 386, 389	in recruits	16, 24, 39, 50, 168, 198, 303, 308, 311, 333, 346, 351, 380, 394
the dietetic factor	225, 395-396	in relation to poverty	19, 43, 257, 402
treatment of (<i>see also</i> Dental Disease)		irregularities in teeth and	29, 282, 301
why so common in childhood	387	leaflets on	15-27, 52, 54
Dental Disease (<i>see also</i> Dental Caries)		liability to	119, 202
a cause of blood poisoning	182	malnutrition and	172, 261
a cause of shortened life	1, 18	medical benefit	21, 24, 25, 39
age for commencing treatment	275, 291, 296, 395	miscarriage and	238, 239, 240
anæmia	20, 22, 23, 34, 230, 235, 281, 316	mouth as a source of infection	39, 169
appendicitis and	22, 48, 50, 54, 108	mouth-breathing and	109
bottle feeding and	30, 36	need for co-operation of parents	397, 401
breast feeding and	4, 30, 110, 229, 268	need for research	9, 53, 264, 304, 389
cancer and	50, 54, 161	nervous system and	38, 42
causes of	28, 48, 49, 73, 108, 183, 307	of Americans	17, 49, 54, 56, 296, 346, 370, 375, 402
civilisation and	173, 174, 201, 387	of Canadians	122
comparison with alcohol	17-18	of children of Central Europe	208, 227
consequences of	176-182	of Egyptians	54, 396
constitutional and predisposing causes	6, 57, 260-261, 269, 276, 361, 387-388	of Esquimaux	213
danger to the public	39	of Highlanders	315-316
dummies and	30, 36, 268	of Italians	65
economic loss through	20, 21, 24, 42, 47, 57, 182, 303	of Maoris	35, 65, 217, 345
effect on growth and development	283	of Poles	224, 263, 269
		premature loss of teeth	3, 175

- | | PAGE | | PAGE |
|---------------------|----------|--|-----------------------------------|
| Kelynack, Dr. T. N. | 13, 132 | Mastication, reduced consumption of | |
| Kerchensteiner, Dr. | 156 | bread through | 134-136, 137-140 |
| Kersting, Professor | 330 | teaching of (<i>see</i> Oral Hygiene) | |
| King, Dr. Truby | 121, 143 | unilateral | 333-334 |
| Klein, Miss Rita | 13, 312 | why essential | 115, 116, 187 |
| | | Matthews, G. F. Cale | 398, 399, 401 |
| | | Matthews, J. Hilditch | 153, 274, 335 |
| | | "M.C.A." | 62 |
| | | McClure, Dr. W. St. C. | 13, 171 |
| | | McCullough, Dr. | 126, 127 |
| | | McDonald, J. A. | 15 |
| | | McGhee | 225, 240, 257, 265, 288, 290 |
| | | McGovern Trust, The | 123 |
| | | McIlroy, Professor Louise | 244 |
| | | Meals, correct ending of | 6, 50, 133, |
| | | | 190, 321, 331 |
| | | Meals, drinking at | 45, 46, 103, 104, |
| | | | 128-132, 139, 141, 319, 321, |
| | | | 323, 331, 333, 385, 391, 401 |
| | | drinking between | 103, 104, 130, |
| | | | 318, 319, 331, 398 |
| | | eating between | 42-43, 50, 65, 129, |
| | | | 130, 132, 133, 174, 189, |
| | | | 242, 317, 321 |
| | | intervals between | 321 |
| | | number of | 125, 190-191 |
| | | time allowed for | 319 |
| | | Meat | 33-34, 50, 51, 71, 72, 130, 131, |
| | | | 132, 248 |
| | | Medical curriculum, reform of | 9, 11, |
| | | | 12, 301, 390 |
| | | profession | 8, 10, 11, 13, 31, 59 |
| | | scholarships and prizes | 11 |
| | | Medical Research Committee | 93, 113, |
| | | | 202 |
| | | Medicine, preventive | 8, 20, 25, 26, 27, |
| | | | 239 |
| | | Mellanby, Dr. Edward | 1, 9, 10, 202- |
| | | | 203, 206, 262, 265, 402, 407 |
| | | Mellanby, Mrs. May | 9, 56, 111, |
| | | | 200-210, 214-215, 217, |
| | | | 219-220, 221, 223, 225-227, |
| | | | 257, 261-266, 269-270, 289, |
| | | | 335-337, 360, 364-367, 371, |
| | | | 376-378, 402, 407 |
| | | Miles, Eustace | 55 |
| | | Milk | 7, 12, 58, 90, 102-106, 130, 191, |
| | | | 197-198, 216, 222, 273, |
| | | | 370, 388 |
| | | "A curious dietetic fallacy" | 58, |
| | | | 104-105, 216 |
| | | an unhygienic food | 104, 273 |
| | | biscuits and | 49, 89, 103, 117, 118, |
| | | | 129, 130, 132, 191-192, 272, |
| | | | 321, 328, 345 |
| | | bread and | 89, 103, 129, 321, 329, 345 |
| | | cow's | 49, 89, 105, 207 |
| | | effect of, on the teeth | 90-91, 104, |
| | | | 273, 387-389, 394 |
-
- L**
- Lane, Sir W. Arbuthnot 214
 Langworthy, Dr. C. F. 101, 415
 League of Nations 12, 244
 Lennard, Miss May 13
 Lewin, Dr. Octavia 108, 110
 Lindsay, Robert 13, 53, 268-270, 299,
 304, 306-310, 334-335
 Lips and tongue, cleansing action
 of (*see also* Oral hygiene) 36, 248
 Locke, John 131
 Lomax, T. 13
 London, The Lord Mayor of 128
 Love, Hugh 403
 Lyster, Dr. R. A. 53
- M**
- Macalister, Sir Donald 166
 Mackenzie, Lady Leslie 26
 Maize 67, 98
 Malnutrition 21, 23, 280, 281
 (*see also* Dental Disease and
 Dental caries)
 Manchester, the Bishop of 5
 Manchester Conference 6, 7, 8, 11,
 12, 13, 14, 15, 45, 53, 56, 117, 132
 composition of 6
 conclusions of 6-7
 cost of 171
 exhibition at 335-337
 keynote of 8
 Margarine 63, 210
 Marmalade 89, 129, 130, 132-133,
 188-189
 Mastication 6, 28, 31, 42, 57, 80-84,
 107, 108, 127, 129, 131,
 133, 178, 179, 184, 190,
 191, 194, 198, 213, 216,
 242, 248, 249, 251, 284,
 286, 301, 306, 336, 357,
 376, 385
 and athletics 323
 a cure for indigestion 181
 improved health through 135-142,
 146
 its effect on jaws and teeth, 118,
 214, 252, 253
 nature of 180, 252-253, 258
 physiological effects of 135, 137-138,
 141, 180, 181, 285, 328, 376

INDEX

431

	PAGE
Milk, "Gloriously healthy children" and	105
last thing at night	130, 198, 387
mother's	34, 105, 231-238
pudding	132, 216, 222
use of, by adults	102-104, 273
Milk puddings	132, 216, 222
Miller, Dr.	85, 200, 272
Milligan, Sir William	6, 159-161, 171, 199, 348, 360
Ministry of Health	12, 47, 54, 59, 94, 243, 256, 303, 307, 389, 394
Moore, Miss Barbara	14
Moore, Miss Dorothy	322, 327
Morris, H. J.	57
Moses, the laws of	106
Mouth breathing	28-29, 255, 391
connection with nose blockage	188
in primitive folk	109
origin of	281
Mouth disease, in man and animals	304
Mouth, rinsing of (<i>see</i> Oral Hygiene)	
"Mr. Scrunch"	327, 345
Mucus membrane, action of food on	75
Muller, Professor	23, 148
Mummery, J. Howard	124

N

Nansen, Fridtjof	330
Napoleon	17
National Food Reform Association (<i>see also</i> Food Education Society)	22, 136, 148, 318
National Health	4, 8, 16, 19, 20, 22, 26, 39, 40, 43
a Colonial impression	15
Newman, Sir George	170, 281, 313, 320, 344
Nicholls, Brooke	285
Niven, Dr. James	13, 152, 153, 155, 157
Norman, H. W.	13
Nose	24, 28, 31, 37, 46, 108-116
(<i>see also</i> Mouth breathing)	
functions of	108

O

Oatcake	98, 133, 219
Oatmeal	7, 32, 207, 268
O'Meara, Miss Natalie	14
Ontario, dental survey in	123
Oral hygiene	4-6, 67, 76, 124-126, 142, 154, 187, 198, 223, 225, 230, 270-271, 315, 328, 361
(<i>see also</i> Diet, Self-Cleansing, Mastication, Toothbrush)	

Oral hygiene, afternoon tea and	132, 321
bread and	88
fruit, value of, in	66, 129, 133, 190-192, 266, 270, 396
glands of	186-187
in Japan	124
instruction in	5, 154, 162, 172, 241, 392
effects of	260, 267, 276
mastication, lessons in	45, 135-140
methods of propaganda	25, 52, 54, 254, 301-302, 305, 309, 310, 312, 318, 401
in rural districts	241, 302
mouth, rinsing of	44-45, 133, 251
need for co-operation in	9, 10, 21, 247
need for co-ordination in	243
of Indians	44, 174
our low standard of	67, 73, 155, 230, 239, 240, 347
part of health visitors	392
part of home and school	126
prizes and scholarships in	11, 45
relation to nasal	108-109
saliva, action in	186-187, 373
schools, teaching in	5, 44, 128, 134, 240, 312, 392

(*see also* Mastication)

suggestions for local campaign	313, 336
talks to school children	312, 325-327
the Food Education Society	
and	122-124, 154, 241, 315-332, 379, 495
the practice of	66
two methods of	189-190
Osler, Sir William	109, 162, 261

P

Painter, Dr. Charles F.	61
Palate, function of	144
Palmer, Charles	382
Parkinson, Dr. Malcolm	27
Parrott, A. H.	397
Paste	250
(<i>see</i> Powder)	
Paton, J. Lewis	56, 313-314, 335, 343
Paton, the Rev. Dr. J. B.	314
Pavlov, I. P.	62
Pedley, Denison	200, 219, 220, 406-407
Petrie, Professor Flinders	336
Petty, Miss Florence	1, 11, 13, 63, 106, 117, 154, 241, 305, 312, 327
Phillips, Dr. Mary E.	109

INDEX

433

PAGE

Sugar, action of saliva on 187-188
 cane 49, 58, 64-65, 75
 consumption per head in
 England 49
 consumption per head in Italy 65
 do adults require it? 61
 grape, test for 137-138, 333
 in babies' bottles 64
 in soldiers' rations 62
 its home manufacture 49, 63, 328
 suggested taxation of 258, 390, 394
 the medical profession and 65
 Sullivan, Dr. W. C. 111
 Sutherland, Dr. J. J. 61
 Sweets (*see also* Dental Caries and
 Dental Disease) 4, 7, 51, 62-63,
 65, 78-79, 86, 124, 130, 133,
 187-189, 191-192, 194-198,
 260, 265, 267, 272-273, 313,
 318, 391
 alleged craving of children for 124, 272
 between meals 42, 65-66, 118, 130,
 133, 189, 191, 194, 317-318
 evils of eating 42-44, 65
 money wasted on 43, 232, 317, 328
 suggested legislation regarding 19
 sweet shops 19, 43, 54, 66, 222

T

Tagore, Rabindranath 329
 Tawney, R. H. 6
 Taylor, Sedley 12
 Tea 1, 35, 63, 99, 150, 192, 316-319,
 328
 Teeth
 as an adornment 176
 attrition 178, 336, 357
 as an index of mastication 285,
 286, 287, 326
 bones, a paralled with 114
 causes of irregularity 211, 215
 changed attitude required 174
 children's 4, 99, 155, 219, 294
 at birth 19, 219-220, 284
 diet and the 4, 201, 299
 dirty (*see* Oral Hygiene)
 handicap of artificial 178-179
 human and puppies' 220
 in old age 4, 133, 149, 175
 lectures on the care of (*see* Oral
 Hygiene)
 milk 4, 210, 275, 278-279, 283-284,
 365
 of the British people 6, 160, 163,
 173-176, 199, 315-318, 356
 perfect 124, 271, 325
 perfect adult 4, 149, 320
 premature loss of 3, 175

Teeth, salts needed for bone de-
 velopment (*see also* Salts) 32-35, 93
 soft, cause of 116-117
 sound, value of, to nursing
 mothers 239
 temperature of food and 125-126
 unsightliness of artificial 177
 "Weavers" 291-292
 Temple, The Rev. Dr. William 5
 Temporary dentition (*see* Milk
 Teeth)
 The Lord Mayor 310
 "The Pudding Lady" (*see also*
 Miss Florence Petty) 56, 107
 The Times 128
 The Times, medical correspondent of 37
 Thompson, Sir Henry 131, 402
 Thomson, George 26, 243, 402
 Thumb sucking (*see also* Dental
 Disease) 213, 227, 360
 Toast 98, 191, 306
 Tohunga, a Maori 66
 Tomes, Sir Charles 220, 226, 269
 Tongue (*see also* Lips and)
 functions of 212-214
 Toothache 236, 280, 318, 350
 causes of 178, 179
 " in the head " 179
 Toothbrush 7, 116, 126-127, 149, 169,
 191, 248-250, 256, 257-259,
 265, 266, 275, 276, 309,
 313, 314, 318, 320, 325,
 352, 353, 365-368, 394, 395,
 404
 and dental caries 259
 proper use of 249-250, 259
 Toothpick 253
 Treatment (*see* Dental Disease
 and Dental Caries)
 Truby King, Dr. F., 17, 21, 22, 121-122,
 143-148, 208, 320, 325
 Tuberculosis (*see* Dental Disease)
 Tuck Box 130, 134, 322-323
 Shop 322-323

U

Ulcer 181

V

Van Noorden 34
 Vegetables 2, 34, 94, 106, 107, 133,
 192, 203, 321, 329
 (*see also* Cookery)
 Vitamines 2, 9, 10, 28, 32, 35, 36,
 96, 99, 106, 107, 110, 112,
 161, 202, 206, 207, 208,
 209-210, 214, 216, 218, 221,
 226, 227, 256, 262, 264, 266,
 365, 369, 377, 420

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